POPULAR Computing WEEKLY

23 September 1982 Vol 1 No 23

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How to submit articles
Articles which are submitted for publication should not be more than 1000 words long.

All submissions should be typed and a double space should be left between each line.

Programs should, whenever possible, be computer printed.

At present we cannot guarantee to return every submitted article, so please keep a copy.

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

This Week

Cover illustration by Teoman Irmak

Editorial

Aladdin's Cave is not a new type of adventure game. It is an aptly named treasure house of 'free' software games, according to Prestel.

The idea behind the scheme is that, with the aid of a Prestel adaptor, you dial up Aladdin's Cave and see what programs are on offer. If any of the games take your fancy, you can download them directly into your micro.

On the surface, Aladdin's Cave is an excellent idea. But the services of the genie are not free. Apart from the cost of the adaptor, you must join Prestel's Micronet 800 scheme (*Popular Computing Weekly*, September 16) which costs about £50 a year.

In addition, the best programs are unlikely to be in Aladdin's Cave. They will be available elsewhere in the Micronet system, at commercial rates. Unlike Aladdin's Cave, you will be charged for downloading these programs.

Nevertheless, Aladdin's Cave and the Micronet 800 scheme could change the face of the software market in this country. It will certainly be easier to download a program than to go out, buy a cassette and load it into your micro. Whether or not it will be cheaper remains to be seen.

Next Week

Journey to the centre of the earth and beyond, in Tunnel — a new game for ZX81.

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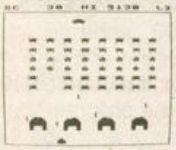

Actual screen photo

Cassette nine contains Model B Invaders. A superb full feature adaptation of the arcade 'Space Invaders' game in machine code and high resolution colour graphics for the Model B BBC micro. Play normal game or choose from the many options including missile, bomb and invader speeds, invisible/visible invaders and shields/no shields. Quite simply the best — only **£6.95 inc.**

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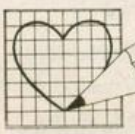

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New Rom for BBC micro in November

ACORN is to charge owners of the BBC micro for 1.0 operating systems to replace the present 0.1. The new Series 1 Roms should be available by the middle of November.

In the case of orders for the Acorn disc interface (which costs £70) the new operating system will be supplied free. Owners not wishing the disc interface will pay £11.50, says Acorn's Technical Adviser, David Simpson.

Several aspects of the present 0.1 operating system are causing problems for users: the 0.1 will not support paged Roms — including disc operating system teletext adaptor or Econet system; there are problems with the Save and Load facilities and with some of the Fx calls.

These difficulties have been corrected in the new Roms. David Simpson explains: "The new system gives extra operating system calls, irons out a bug in the Rom in the Print # statement and allows the input of serial data using simple Fx commands."

"The 0.1 operating system is adequate but the subject of many discussions. We have asked Acorn for a definitive answer on pricing," said John Radcliffe, Executive Producer of the BBC's Computer Programme.

Acorn's John Horton said "We don't consider that people need the 1.0 system unless they have a disc operating system to support. Problems arise when dumping large amounts of software on to tape, and are caused by machine faults in the 0.1 operating system, but there is a well-publicised machine-code patch to solve most of the problems."

Cut-price Pets

COMMODORE has cut the prices of its Pet range of products for use in education.

The cost of Pets in schools has been cut by between 20 and 33 percent for a three-month period which began on September 1.

This move is a reaction to the company's exclusion from the government's Micros in Schools grants scheme (August 12).

A window into summer for enthralled youngsters.

Cheap holidays for micro kids

THIS Summer over 200 boys and girls will have benefited from Tandy Computer Camps, a scheme organised by the North London based community resource group, Inter-Action.

Ed Berman, Inter-Action's founder, said: "The non-residential sessions help those kids who cannot afford to take advantage of the more expensive residential Summer camps outside London.

"We are a charity. The camps are run as a service for kids who are really keen to learn and not as a money-making exercise."

Inter-Action sessions cost £4 per day. Those attending are taught to use the Tandy and Commodore microcomputers by six undergraduate tutors.

Z80 disc pack from torch

TORCH Computers has launched a Z80 Disc Pack for the BBC micro. The unit includes a Z80 card which enables the machine to run CP/M[R] software.

The unit has a capacity of 800K, uses twin 5¼in double-sided 80-track discs and includes its own power supply.

The Z80 card fits inside the lid of the BBC machine and connects to the tube interface. The disc unit connects to the disc interface. A detailed instruction manual gives installation and operational advice.

Possible expansion options for the system include upgrading to a Winchester drive and addition of the Torch communications card which can be fitted inside the disc unit to provide Prestel, Viewdata and auto-dial capabilities.

The disc unit is already available as part of the Torch microcomputer package — based around the BBC machine — and costing £3500.

The Torch Z80 Disc Pack costs £995. An Acorn disc interface is also necessary and costs £70. The Corresponding Acorn disc drive costs £235 for 200K. The Acorn Z80 card is not yet available but is expected to cost over £300.

Further information on the Torch Z80 Disc Pack is available from Torch Computers, Abberley House, Great Shelford, Cambridge.

Torch Z80 Disc Pack.

HP conference

PPC-UK, the British arm of the Hewlett Packard Programmable Calculator International Users Group, is holding its annual conference in London on Saturday, October 9.

The cost of the PPC-UK meeting will be £15 (members) and £20 (non-members). More details from David Burch, PPC-UK, Astage, Rectory Lane, Windlesham.

Micronet 800 — a new deal from Prestel

PRESTEL has released more details of its Micronet 800 scheme, announced last week.

The scheme, due to be launched in January, will enable subscribers to buy a range of software and download it into their micros. An educational exchange library will enable schools and colleges to share programs written by teachers and students. Subscribers will also be able to exchange messages with each other, and any other Prestel user.

The Amateur Computer Club and other local groups will be able to use the system to keep their members up-to-date on club activities.

Aladdin's Cave is a collection of software, indexed by both subject and micro, that can be accessed for free.

Micronet 800 is a joint venture between Prestel/British Telecom; EMAP Computer & Business Publications Ltd/ Telemap Ltd; ECC Publications Ltd and Prism Microproducts. Subscription to Micronet 800 will cost approximately £50 a year.

Further information is available from Micronet 800, Telemap Ltd, Bushfield House, Orton Centre, Peterborough PE2 OUW (telephone 0733-236113).

Move over Jaws — ET is on your trail

ATARI has signed a deal with MCA to produce a series of computer games based on the theme of Stephen Spielberg's new billion dollar film, *ET: The Extra Terrestrial.*

Graham Daubney, Atari's software manager, told *Popular Computing Weekly* "The games will use the *ET* characters and we hope to see them shortly after the film's UK launch at Christmas — definitely in the first quarter of 1983."

The deal is one of many being set up by Merchandising Corporation of America to produce spin-offs from the movie.

ET has been on general release in the US since July, and will be released in the UK later this year.

Letters

write to Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2

Spelling out magic numbers

Glad to see that Sinclair have now reached the magic figure of 42 (*Popular Computing Weekly* July 29). I had thought, by the service and attention received from them, that they were at Milliways spending the year dead for tax reasons.

J Roberts
10 Bulrush Close
Hatfield
Hertfordshire AL10 8PE

3-dimensional graphics

I would like to congratulate you on achieving a good mix of interesting items in your weekly magazine. Of particular interest to me at the moment is Nick Hampshire's page on Spectrum graphics as I, along with others, await delivery of said machine.

Could you ask Nick Hampshire if it is possible to have a moving/rotating disc or wheel, as this could really be developed into some interesting graphics. In the meantime, I am saving all the articles ready to develop in my new Spectrum when it arrives.

Don Williamson
44 Sutton Park Drive
St Helens
Merseyside WA9 3TR

In answer to your query, see *PCW* July 8 for Nick Hampshire's rotating fan program.

Conspiracy of talents

One of your rival magazines recently gave the following quote: "It is better to know where to go and not how to get there than to know how to get there but not know where".

Unfortunately, many of your readers, including myself, fall into the latter category. We are capable of writing complex programs, but cannot think of original programs to write. Thus we are forced to reproduce arcade games such as *Puckman* and *Space Invaders*.

However, not only does this mean that there is only a small range of programs available, but also that many programmers risk prosecution (re Copyright, *Popular Computing Weekly*, August 5).

I feel it would be a good idea if people could pool ideas for new games ie those people with imagination, but little knowledge of programming, could publicise their ideas for others to computerise. A small percentage of any money made selling the program would be paid to the originator of the idea as an incentive.

Unfortunately, this pooling of ideas would need a large database for storage, and printing facilities. At present, I have neither and thus cannot operate such a scheme.

However, I would like to hear from any company with these facilities who would be interested in running this type of scheme. Ideally, the company would also market the finished product, handling the payments to both the programmer and the originator of the idea.

John Hardman
65 Sandringham Drive
Welling
Kent DA16 3QZ

A philosophers life

I recently realised that I spend as much time watching a 32 × 24 matrix visualised at the end of a cathode ray tube as I do eating.

Is this part of the natural order of life, the universe and everything?

Simon Cross
6 The Avenue
Ipswich IP1 3SY

Leapfrogging in Street Alley

Re Street Alley (*Popular Computing Weekly*, August 12). Excellent game, but the frog has only one foot. To get two feet, the eighth number of 750 should be 199.

If a man is preferred, then 750 should read:

```
750 Data 60,60,24,255,189,
189,36,231,63
```

Alternatively, the first eight numbers can be any from A Blackham's character maker (July 15).

G. Foreman
82 Hazelton Road
Colchester
Essex CO4 3DY

Soldering on whirrs away

I ordered my Spectrum on May 10 and it arrived on August 5.

When I switched it on, I was surprised to hear quite a loud buzz from inside the case — it sounds like an electric motor whirring away. Using it with a Sony Trinitron, the set recommended by Sinclair, produced disappointing results with rolling bands of random colour. Trying it with a Sharp set was more successful with clean, steady colours although there was a pronounced shimmer on graphics. Yellow ink on green paper was virtually unreadable.

A chat with a friendly TV engineer threw some light on the problem with the Sony. He suggested I try adjusting a trimmer capacitor inside the Spectrum. Getting inside was much easier than with the ZX81, as there are no screws hidden under the feet. A small adjustment to the trimmer was all that was needed to make the Sony lock on.

I also found that very small adjustments affected the shimmer. I have been able to reduce it a little, but it is still far from perfect. The pixels now tend to pulse rather than wobble. Surely this must be a design fault?

After several hours of use, the internal temperature becomes disturbingly high (the heat sink is almost too hot to touch). It was during a cooking session when a bug developed, the *Beep* command caused the computer to *New* itself. Worse still, *Load* would not work and *New Newed* without having to press *Enter*. Switching off for a while restored everything to normal. Another look inside for dry joints etc, revealed a crack in a fine section of track, cured with a blob of solder.

Since then the computer has behaved itself and despite these problems, I like the machine.

S R Aizlewood
19 Brushfield Road
Holme Park
Chesterfield
Derbyshire

Doubled up on Vic20

Enclosed is a very simple and short method of obtaining double height characters on the Vic20. This method can be used with the basic Vic or with any expanded Vic. But, with cartridges that program the function keys, these have to be re-defined, eg, 'Key 1,"Graphic" '.

This program reproduces all the standard letters and graphics which appear on the right hand side of each key. The memory required to program the characters is just under 1.5K, leaving 2K of memory still intact.

It is advisable, after the characters have been programmed, to *New* the program used, as to get into the double height mode you have to type in the following — *Poke* 36867, (*Peek* (36867)) *or* 23, and, *Poke* 36869,254. The programmed characters cannot be written over by another program in memory, so a program of up to 2K can be entered safely without fear of deleting the characters.

The program: Line 1 — Sets various memory pointers to prevent 'writing over'. Lines 2 and 3 — Transfer characters from Rom into Ram. Line 4 — Changes screen colour/Puts Vic into double height mode. Line 5 — Changes character set to programmable one (254).

```
1 POKE 56,24:POKE 55,0:CS=6144
2 FOR I=CSTO 7678
  STEP2:Z=PEEK(32768+(I-CS)/2)
3 POKE I,Z:POKE I+1,Z:NEXT
4 POKE 36879,25:POKE
  36867,(PEEK(36867))OR 23
5 POKE 36869,254:POKE 36881,24
```

Chris Groenhout
25 Kerferd Street
Watson ACT 2062
Australia

COVER STORY

Kong's Revenge

A new game for Spectrum
by Jonathan Flint

This is an arcade style game for the Spectrum. The idea is to climb a layout of girders safely while collecting as many points as possible (as shown by your score at the top of the screen). Points are gained by taking the white parasols which are found at various locations.

For reasons which may escape you, a large gorilla is throwing barrels at you as you climb. These barrels should be avoided at all costs. If there is sufficient head room, you may jump over them as they pass. Your character (a little blue man) is moved using the following keys:

z..... LEFT
c..... RIGHT
x..... DOWN
s..... UP

Caps Shift together with one of the above keys enables your man to jump in the appropriate direction, ie *Caps Shift z* jumps you to the left. Jumps are required over barrels and across gaps in girders. Beware the *x* key — it moves you down whether or not there is a ladder beneath to support you.

The game has four stages. You receive a large bonus when progressing to each new stage. To reach a new stage you must climb to the highest point on the screen and then simply jump into thin air.

The first three levels can always be scaled if you choose your route carefully, but the fourth (with no ladders) is sometimes impossible. You may have to go out of your way to pick up a parasol but this must be done before a barrel rolls over them. If this happens the parasols will lose their *Brightness* and become worthless.

The program starts with a series of data statements. Lines 11, 12, 13, 15 and 16, define the user defined graphics used in the game. When entering the program from the keyboard, you should Run lines 1 to 90 as soon as they have been written in order to define the graphics.

These graphics and the lines in which they appear are:

Graphic:	Lines:	
"p"	255,550,560,570	(Parasols)
"d"	1100,1126,2005	(Man)
	2030,2120,5010	
	5030,5050,5060	
"h"	5280	(Ladder)
"f" and "g"	5180	(Gorilla)

Lines 5190, 5200, 5220 use standard mosaic graphics.

The remaining data statements define the girder layouts and the ladder locations used in stages two and three. Lines 100 to 570 use this data to draw levels. The main playing loop lies between lines 1100 and 1500 and contains a minimum number of lines to keep things fairly fast.

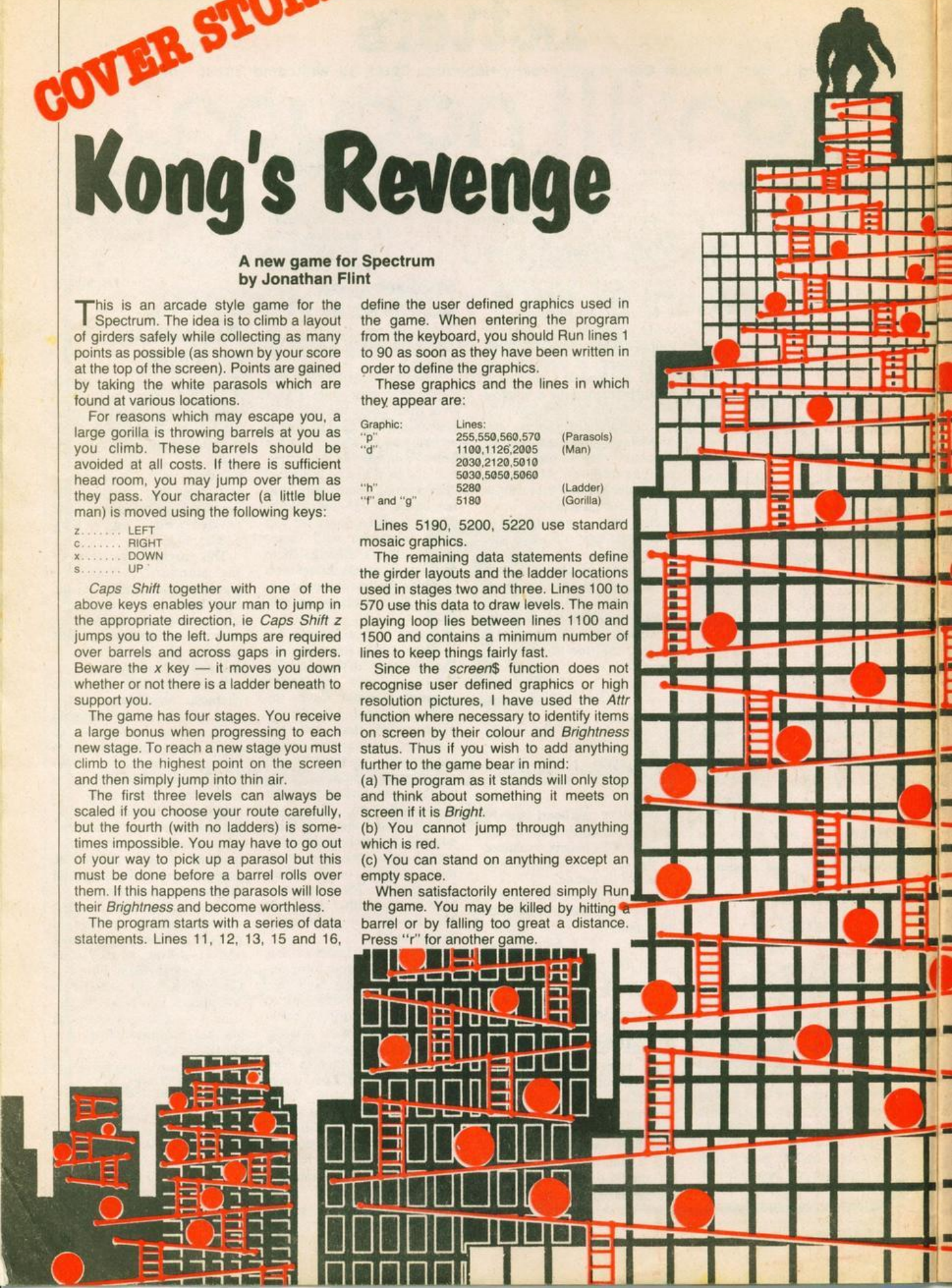
Since the *screen*$ function does not recognise user defined graphics or high resolution pictures, I have used the *Attr* function where necessary to identify items on screen by their colour and *Brightness* status. Thus if you wish to add anything further to the game bear in mind:

(a) The program as it stands will only stop and think about something it meets on screen if it is *Bright*.

(b) You cannot jump through anything which is red.

(c) You can stand on anything except an empty space.

When satisfactorily entered simply Run the game. You may be killed by hitting a barrel or by falling too great a distance. Press "r" for another game.



```
  1 REM Kong's Revenge
  2 REM By J. Flint
  3 REM
 10 BORDER 6: INK 1: PAPER 6: C
LS
 11 DATA "f",0,BIN 00001100,BIN
 00001100,0,0,BIN 00001111,BIN 0
0001010,0
 12 DATA "g",0,BIN 00110000,BIN
 00110000,0,0,BIN 11110000,BIN 0
1010000,BIN 11110000
 13 DATA "p",BIN 10001110,BIN 0
1110001,BIN 01100000,BIN 0101000
0,BIN 10001000,BIN 10000100,BIN 1
0000010,BIN 01000100
 15 DATA "d",BIN 00001000,BIN 0
1111110,BIN 10011000,BIN 0011110
0,BIN 00100100,BIN 00100100,BIN
00100100,BIN 00110110
 16 DATA "h",BIN 01000100,BIN 0
1000100,BIN 01000100,BIN 0111110
0,BIN 01000100,BIN 01000100,BIN
01000100,BIN 01000100
 18 DATA 18,17,6,28,14,2,25,16,
4,0,0,32,0,16,18,16,2,3,2,8,5,20
,4,12,0,4,10,11,6,9,21,8,3,24,12
,7,0,12,21
 19 DATA 13,10,0,8,0,12,24,9,5,
0
 20 DATA 0,16,20,21,16,10,0,12,
20,21,12,1,22,10,1,12,18,7,27,2,
4,24,1,2,29,0,0,2,8,3,0,0,32,2,4
,26,18,8,14
 21 DATA 25,5,0,9,0,13,5,0,25,9
 30 FOR g=1 TO 5
 40 READ a$
 50 FOR x=0 TO 7
 60 READ a
 70 POKE USR a$+x,a
 80 NEXT x
 90 NEXT g
100 LET sc=0: LET l=0
101 BRIGHT 0: BORDER 6: INK 1:
PAPER 6: CLS
102 OVER 0: INK 2
105 FOR x=1 TO 140 STEP 32-16*(
l>2)
110 PLOT 0,x
130 FOR n=1 TO 31
140 DRAW 4,0: DRAW 0,4: DRAW 4,
0: DRAW 0,-4
150 NEXT n
155 DRAW 0,6
160 DRAW -248,0
170 NEXT x
175 GO SUB 5170
250 FOR Y=5 TO 19 STEP 4-2*(l>2
)
255 PRINT AT y+1,RND*29; BRIGHT
1; INK 7;"X"
260 LET t=28*RND
261 LET s=26*RND
265 PRINT AT y,s;" "
290 IF l<=2 THEN GO SUB 5270
300 NEXT y
310 PLOT 200,143
320 DRAW 7,0
330 PLOT 216,159
340 DRAW 7,0
350 GO TO 1000
390 INK 2
395 FOR t=1 TO 13
400 READ a,b,c
410 PLOT a*8,b*8+6
420 FOR x=1 TO c-1
430 DRAW 4,-2: DRAW 4,2
440 NEXT x
445 DRAW 4,-2: DRAW 3,3
450 DRAW -8*(c-.1),0
460 NEXT t
500 FOR c=1 TO 5
510 READ t,y: GO SUB 5270
520 NEXT c
530 GO SUB 5170
540 BRIGHT 1: INK 7
550 PRINT AT 6,1;"X"
560 PRINT AT 12,3;"X"
570 PRINT AT 18,30;"X"
580 IF l=2 THEN PRINT AT 2,13;
INK 1;"OOOOOO"
1000 LET y=0
1010 GO SUB 4000: GO SUB 4010
1020 BRIGHT 0: OVER 1: INK 8: FL
ASH 8
1030 LET y=20: LET x=0
1040 PRINT AT 1,14; OVER 0; INK
7; BRIGHT 1;sc
1100 PRINT BRIGHT 8;AT Y,X;"A"
1104 IF SCREEN$ (y+1,x)=" " THEN
 GO SUB 2000
1105 PRINT BRIGHT 1;AT p,q;"O"
1110 PRINT BRIGHT 1;AT p1,q1;"O"
1120 BEEP (INKEY$<>"")/50,-y
1125 IF ATTR (y,x)>64 THEN GO TO
 3000
1126 PRINT AT Y,X;"A"
1130 LET x=x+(INKEY$="c")-(INKEY
$="z")
1132 LET y=y-(INKEY$="s")+(INKEY
$="x")
1140 IF INKEY$<"a" AND INKEY$>"A
" THEN GO SUB 5000
1150 PRINT ;AT p,q;"O"
1160 PRINT ;AT p1,q1;"O"
1170 GO SUB 3510
1180 IF SCREEN$ (p+1,q)=" " THEN
 LET p=p+2
1200 IF SCREEN$ (p1+1,q1)=" " TH
EN LET p1=p1+2
1500 GO TO 1100
2000 REM DROP
2005 PRINT AT y,x;"A"
2007 IF y<1 THEN GO TO 6000
2010 FOR b=1 TO 2
2020 LET y=y+1
2030 PRINT AT y,x;"A"
2040 IF SCREEN$ (y+1,x)="" THEN
BEEP .1,-12: RETURN
2060 GO SUB 3510
2120 PRINT AT y,x;"A"
2125 NEXT b
2130 IF SCREEN$ (y+1,x)="" THEN
GO TO 2500
2140 LET y=y+1: GO TO 2130
2500 PRINT AT y,x-2; OVER 0; FLA
SH 1; INK 2;"SPLAT"
2530 FOR x=0 TO -30 STEP -1: BEE
P .05,x: NEXT x
2540 IF INKEY$="r" THEN CLS : RE
STORE 18: GO TO 100
2550 GO TO 2540
3000 REM BRIGHT
3005 IF ATTR (y,x)<>119 THEN GO
TO 2500
3010 BEEP .2,36
3020 LET sc=sc+100
3030 PRINT AT 1,14; OVER 0; INK
7; BRIGHT 1;sc
3040 PRINT AT y,x; OVER 0; INK 1
;" "
3050 GO TO 1130
3500 REM BARREL
3510 LET q=q+d: LET q1=q1+d1
3520 IF q1>30 OR q1<1 THEN LET d
1=-d1: IF p1>y THEN GO SUB 4010
3540 IF q>30 OR q<1 THEN LET d=-
d: IF p>y THEN GO SUB 4000
3550 RETURN
4000 LET d=1: LET q=1: LET p=2*I
NT (y/3): RETURN
4010 LET d1=-1: LET q1=29: LET p
1=2*INT (y/3): RETURN
5000 LET g=(INKEY$="C")-(INKEY$=
"Z")
5005 BRIGHT 8
5010 PRINT AT y-1,x;"A": BEEP .0
5,0
5020 IF ATTR (y-1,x)=50 THEN GO
TO 2500
5030 PRINT AT y-2,x+g;"A": BEEP
.05,12
5050 PRINT AT y-1,x;"A"
5060 PRINT AT y-2,x+g;"A": BEEP
.05,24
5080 LET x=x+2*g: LET y=y-2
5090 BRIGHT 0
5100 IF ATTR (y,x)>64 THEN GO TO
 3000
5120 RETURN
5170 REM GORILLA
5175 PAPER 2: INK 0: FLASH 1
5180 PRINT AT 0,9;"▝▀▘"
5190 PRINT AT 1,8;"▟▄▙"
5200 PRINT AT 2,8;"▌▗▖▐"
5220 PRINT AT 3,8;"▙▄▟"
5230 FLASH 0: PAPER 6
5240 RETURN
5260 REM Ladder
5270 FOR X=0 TO 3
5280 PRINT AT x+y,t; INK 1;"H"
5290 NEXT X
5300 RETURN
5000 REM Again
5020 LET sC=sC*2+100
5030 BEEP .3,12: BEEP .3,24: BEE
P .3,12: BEEP .3,24: BEEP 1,0
5040 INK 1: CLS
5050 LET l=l+1
5060 IF l>2 THEN RESTORE 18: GO
TO 101
5070 GO TO 390
```

Street Life

Indoor garden party for ZX fans

***David Kelly** reports on the 4th London ZX Microfair and finds business is booming.*

Over 6000 expectant ZX81 and Spectrum owners made their way to the 4th London ZX Microfair in Victoria on Saturday August 21. The New Horticultural Hall, built in 1928, proved to be far more popular than the previous venue, the Westminster Central Hall. By lunch-time all that could be seen of the hall was a seething mass of heads.

Mike Johnston, the show's organiser was clearly delighted. "My only worry" he said "was that the delay in production of the Spectrum would mean that none of the companies would have any Spectrum products to sell or display."

In the event, most of the companies at the fair managed to put some Spectrum wares on show. This was clearly necessary, since interest seemed to centre on products for the new machine.

Several of the 75 or so exhibitors commented that from the time of the Spectrum launch sales of their ZX81 stock were considerably reduced.

One software company even went so far as to say that its ZX81 stock 'died' with the announcement of the new machine.

It has been a lean time for companies this summer while they waited for their new Sinclair machines. Now, however, most of the companies have received their Spectrums and are frantically trying to stay in a market that has suddenly taken off at a tangent.

After several fairly dismal microfairs — including the last London and Manchester ZX Microfairs — the scene is once again alive.

There were at least eight Spectrums, and one Dragon 32, available on various stands. They proved to be a strong draw for those people still waiting for their own machines.

Kempston (Micro) Electronics demonstrated its new joystick for the Spectrum. The unit plugs into the Kempston I/O controller card which, in turn, plugs into the port at the rear of the machine. Up to four joysticks can be connected to the card at the same time and individually addressed from the Spectrum. The controller card is currently available for £16.50 and the joystick, together with demonstration tape and instructions, will be available by the second week of September for around £9.50.

Avid micro enthusiasts, fingers poised at the keyboard.

Inside the New Agricultural Hall.

Stephen Adams displayed his £7 ZX81/Spectrum Ram converter. This device allows a ZX81 Ram pack to be fitted to the rear port of the Spectrum to convert a 16K machine into a 32K one.

Memotech showed a new Centronics printer interface for use either with the ZX81 or ZX Spectrum. A similar RS232 interface will be available by mid-September. Both interfaces cost £39.95.

East London Robotics had its 64K and 32K plug-in Ram expansion modules for the Spectrum for sale. The boards are available for £50 and £35, respectively. They are also available in kit form, although assembly by inexperienced constructors is not recommended.

Sir Computers had an 8-bit Spectrum I/O port on display, price £14.50, available in mid-September.

Nearly all of the main software companies at the fair had some Spectrum material to show.

Bug-Byte demonstrated its *Spectral Invaders* and Quicksilver had its *Space Intruders* and *Meteor Storm* on view — all for the 16K Spectrum.

Silversoft showed their new games for the 16K Spectrum — *Orbiter*, a version of *Defender*, and *Ground Attack*, a version of *Scramble* — each available for £5.95.

Macronics showed *Word-Pro* for the 48K Spectrum and a game called *Star Quest*. J P Gibbons had a 32K Spectrum *Personal Banking System* on display while Zedxtra showed off its character programmer. C-Tech showed four new games including *Breakout* and *Fruit-Machine*.

Spectrum material was also in evidence from J W V Software and Silicon Software.

The impact of Atari's copyright actions against Commodore and Bug-Byte was being felt by many of the software companies. Concern centred, not so much on the Atari action itself, but on the general uncertainty of this area of the law. No one knows how different a program has to be from an original game before it ceases to be an infringement of copyright.

The next London ZX Microfair will be held on December 18. The venue has yet to be finalised.

Machine Code

Ian Stewart and Robin Jones present a new series for beginners

From the left by numbers

People normally think about numbers in terms of tens. If you write the number 3814 we all understand that to mean:

$3 \times 1000 + 8 \times 100 + 1 \times 10 + 4 \times 1$

and we can see that to get a "place value" from the one on its right we simply multiply by ten. We say the number is in *base* ten.

Because we've been doing this for as long as we can remember, it's difficult to realise that there are other, perfectly sensible, ways of doing the same job. Early computer designers certainly didn't; they used base ten representations in their machines and hit some nasty snags. Most of these problems were caused by the fact that electronic amplifiers don't behave the same way for all the signals you want to imput to them. For instance, an amplifier that is supposed to output double its input signal may well do so for inputs of 1, 2, 3 and 4 units; but then it starts to "flatten off" so that an input of 5 produces an output of only 9.6, 6 produces 10.8, and you can hardly tell the difference between the outputs for inputs of 8 and 9.

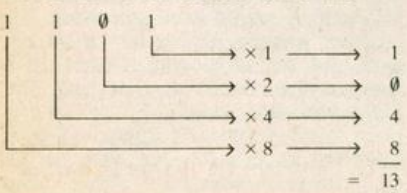
Put a music tape in a cheap cassette recorder and wind up the volume. Hear the distortion in the loud bits? It's the same effect.

The simplest thing you can do with an electrical signal is to turn it on or off; so you can represent the digits 0 (off) and 1 (on) satisfactorily. Distortion no longer matters. It's clear whether a signal is present or not regardless of how mangled it is. But can we devise a number system which only uses 0s and 1s?

Yes. In a base ten number, the largest possible digit is 9. Add 1 to 9 and you get 10—a *carry* has taken place. We can write any number using any other base we choose, and the largest possible digit will always be one less than the base. If the base is 2, the largest digit is 1, so a base 2 (or *binary*) number only contains 0s and 1s.

What about the place values? In the base ten case we got those by starting at 1 (on the right) and multiplying by 10 every time we moved left one place. For a binary number we still start at 1, but we multiply by 2 every time we move left.

So for instance the binary number 1101 can be converted to base 10 like this:



Converting the other way is easy as well. Take 25 for example. If you write down the binary place values:

32 16 8 4 2 1

and work from the left, it's clear that you need a 16. Subtract 16 from 25 and you will be left with 9, and that's made up of an 8 and a 1, so 25 is:

0 1 1 0 0 1

Hexadecimal code

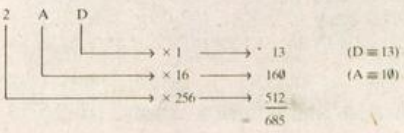
This is fine for relatively small values, but a bit messy for large ones. There are a number of quick conversion techniques, and there are binary-to-decimal and decimal-to-binary conversion program listings in *PEEK, POKE, BYTE & RAM!*; but we want to examine a procedure which makes use of *hexadecimal* code, because it will stand you in good stead later.

A number in hex (nobody ever says "hexadecimal", except us, just now) is a number in base 16. So the place values are obtained by successive multiplications by 16. The first five are:

65536 4096 256 16 1

"Hang about!" everybody's saying. "Those are nasty numbers, and anyway, in base 16 the largest digit has the value 15. Things are getting complicated."

Bear with us. We handle the problem of digits greater than 9 by assigning the letters A-F to the values 10-15. So the number 2AD in hex converts to decimal like this:



Now for the nice feature of hex. Because 16 is one of the binary place values (the fifth one) it turns out that each hex digit in a number can be replaced by the four binary digits which represent it. (By the way, "binary digit" takes almost as long to say as "hexadecimal" so it's normally abbreviated to *"bit"*.) The following table shows the conversions:

Decimal	Hex	Binary
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111

Now suppose we want to convert 9041 to hex. First we extract two 4096s, then some 256s and so on like this:

$$\begin{array}{rl} & 9041 \\ 2 \times 4096 = & 8192- \\ & 849 \\ 3 \times 256 = & 768- \\ & 81 \\ 5 \times 16 = & 80- \\ & 1 \\ 1 \times 1 = & 1- \\ & 0 \end{array}$$

So the hex representation is 2351. Now we just copy the digit codes from the table:

2	3	5	1
0010	0011	0101	0001

and that's the binary equivalent of 9041 — just run the four blocks together to get 0010001101010001.

The hex-to-binary conversion is so easy that, more often than not, we leave numbers in hex even when, ultimately, we need them in binary.

Conversion by Computer

Here's a program to convert from decimal to hex. It successively divides the number by 16, looking at the remainder each time, so it extracts digits in the opposite order to that shown previously.

```
 1 DIM HEX$(4)
 20 LET P=4
 30 LET HEX$="0000"
 40 PRINT "ENTER DECIMAL NO. (MAX:65535)"
 50 INPUT DN
 60 LET N=INT (DN/16)
 70 LET HEX$ (P)=CHR$ (DN-16*N+28)
 80 LET DN=N
 90 LET P=P-1
100 IF DN>0 THEN GOTO 60
110 PRINT "HEX VALUE IS"; HEX$
```

The result is always presented as a 4-digit number, with leading zeroes if there are fewer than 4 significant digits. The program won't work if the result should contain more than 4 digits, but that's ideal for our purposes, as you shall see.

Here's the code to convert in the opposite direction (hex to decimal):

```
140 PRINT "ENTER 4 DIGIT HEX NO."
150 INPUT HEX$
160 LET DN=0
170 FOR P=1 TO 4
180 LET DN=DN*16+(CODE(HEX$(P))-28)
190 NEXT P
200 PRINT "DECIMAL VALUE IS:"; DN
```

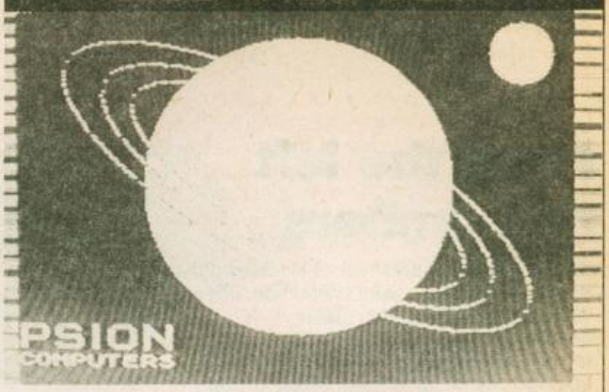
We could tie these routines together with a little menu:

```
  2 PRINT "DEC/HEX CONVERTOR"
  3 PRINT "1)DEC->HEX"
  4 PRINT "2)HEX->DEC"
  5 PRINT "3)END"
  6 PRINT "ENTER 1, 2, OR 3"
  7 INPUT SEL
  8 IF SEL=1 THEN GOSUB 20
  9 IF SEL=2 THEN GOSUB 140
 10 IF SEL=3 THEN STOP
```

and, of course, we'll need *Returns* at lines 120 and 210.

Reproduced from *Machine Code and better Basic*, by Ian Stewart and Robin Jones (Price £7.50), by kind permission of Shiva Publishing Ltd, 4 Church Lane, Natwich, Cheshire CW5 5RQ.

Somewhere over the rainbow?



***Boris Allan** treads the yellow brick road, looking at the latest Spectrum software.*

The ZX Spectrum is a far different machine to the old ZX81, but many software writers do not seem to have noticed.

I was rather disheartened to discover that at least two of the programs were being promoted by their length — a program may be long either because it is complex or because it is poorly written. In the case of two programs I suspect the main reason is the latter.

Some programs loaded the user-defined characters of cassette by use of the *Load "" Code* command which meant that 16K programs would not work on 48K (and *vice versa*). All that was needed was the simple command *Load "" Code Usr* "a" and the same program worked on either system. Little things like this suggested that the program writers did not know the Spectrum well enough to use it to the full.

Other hangovers from the past were the way in which programs were written to use graphics which — apart from the colour — were in no way superior to ZX81 programs.

Of the programs I review here, only some are worth examining in detail. For a change, I will first look at the three which are far and away the worst specimens.

Boris Allan "the ZX Spectrum is a far different machine to the old ZX81".

Inheritance is easily the worst program. For a program with such a long listing there seem to be no error traps — an example of inefficient programming. The game is in two sections, building up an inheritance on the stock market (with a bit of gambling) and then using the inheritance to run a business.

To win at the first section, all you have to do is place half your money on a good bet (or what seemed to be a good bet) and an equal, but minus, amount on a bad bet. For example, in Black-jack if your first card was low, bet a minus amount, so that when you lose you lose a minus amount (ie gain a positive amount). Using such tricks it was easy to win. Surely, no decent program with an 11 foot print out should allow this.

In the second section, all that was needed was to have a negative number of advertising outlets (−1E14 was popular) to succeed. A waste of time. I had more fun trying to trip it up than actually playing it properly.

Venture was little better — a ZX81 program masquerading as a Spectrum program — and again one for which claims were made regarding length. This was the program with copious ZX81-type graphics, and many superfluous *Ifs*. Only capital letters were allowed for input, it would not accept lower case.

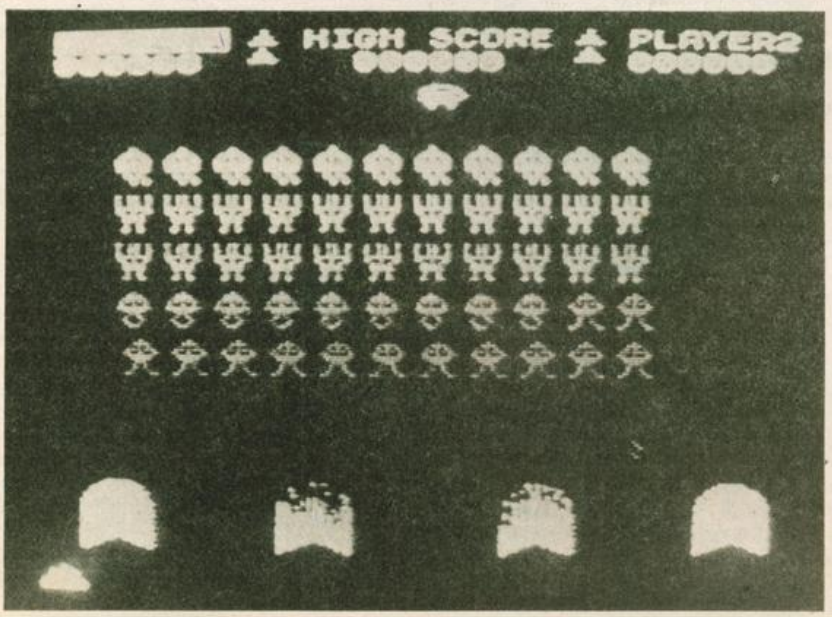
> *"Inheritance is easily the worst program. For a program with such a long listing there seem to be no error traps . . ."*

The program was a series of games on the way to a final maze, where one collected gold. Included were a bomber style game which made little use of the Spectrum's facilities and a Mastermind type game which gave you 14 attempts to find the solution when the most you need is eight. In the final maze, you could accumulate items simply by going over the same spot.

Supersoft supplied three programs — an *Editor, Lgame*, and *Graphics*. At first I thought that the *Graphics* program (it helps to construct user-defined characters) was over-priced at £5 — especially as it is so simple to define characters in any case — but later, when I found that a superior program was part of the free *Horizon* cassette, I was certain.

Lgame (also £5) is based on the original version by lateral thinker Edward de Bono. The program was not complex, though an attempt was made to disguise the structure by the use of *Goto* labels (and not line numbers).

The final offering, *Editor* (at £15), was a text editor — not a word processor. The program was so rudimentary it did not even use the screen, input was into a string at the normal input position. The program's author claims "*Editor* is a program that turns the ZX Spectrum into a true word processor" — but this is just not so. True word processors allow you to



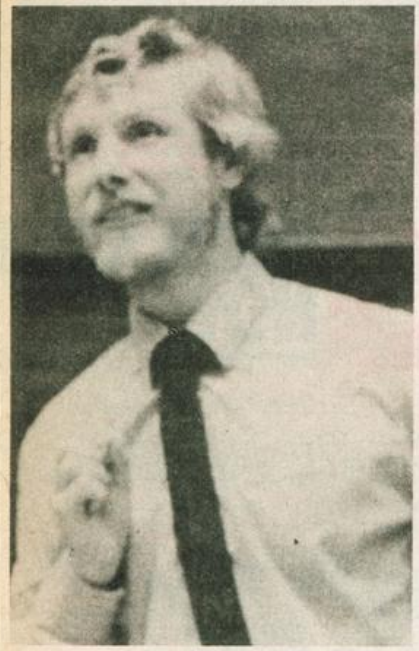
change the formatting of the file, within the file as part of text, and this is not possible with this system. *Editor* is not easy to use, is far too easily crashed, and is not recommended.

Spectral Invaders from Bug-Byte was a distinct improvement, though I prefer Quicksilva's *Space Intruders* and Campbell System's *Gulpman*. *Spectral Invaders* is a rather sedate game of the invaders type, with large slow-moving aliens. Bands of colour are set across the screen and each invader takes the colour of the band, rather than being individually pigmented.

At the end, the increase in speed of the invaders was not significant. The game was also spoilt by having to enter the game each time a base was destroyed — much better the instant appearance of your next base.

All the offerings from Abacus were standard, usually maze-type, games. *Android Pit-Rescue* had a bug in it such that if your laser blasted the bottom of the pit, you had an out-of-range error.

The three games from Lomax were middling. Two (*Defender* and *Thezeus*) loaded defined characters from cassette and the loading program had to be modified to load at *Usr* "a". Defender was



Looking for a pot of gold?

rather tame — almost an introductory attempt to produce a game using graphics, and was of the blow-up-all-the-Klingon-space-ships-with-your-lasers-type. The instructions are not complex — they do not need to be — and are incorrect at one point (it is 0 to fire and not f). *Thezeus* was of the collect-the-goodies-from-the-maze-but-do-not-trigger-the-hidden-bombs-type. *Squash* was poor, without being terrible.

I will discuss the two disassemblers at this point, because they are not games and every program has to be somewhere — to paraphrase Spike Milligan.

Both utility programs worked. *SPDE* had instructions within the program and offered facilities to convert from hexadecimal to decimal and *vice versa* and other little treats. *Spectrum Bug* game with instructions on the insert and an instruction booklet is threatened.

There were little hiccups with both disassemblers. The Artic version (*Spectrum Bug*) was perhaps the more complete, but the Campbell Systems version (*SPDE*) was rather easier to use and modify. *Spectrum Bug* is in machine code, where-

> *"There were little hiccups with both disassemblers. Artic was perhaps the more complete, but Campbell Systems easier to use and modify."*

as *SPDE* is written in Basic. There is little to choose between them, though my personal preference is for *SPDE*.

The *Horizons* cassette is now to be given away free with every Spectrum. Apart from one bug in the keyboard trainer (characters were selected at random and sometimes *Enter* was chosen, and appeared as a "?") *Horizons* seems fine.

Side A is explainatory — What is a computer, What is a Spectrum, and What is a keyboard? While it generated no great enthusiasm, the keyboard trainer was more fun than some of the other cassettes reviewed here.

Side B contained games and demonstrations, including the best *Break-out* version yet seen for the Spectrum, a competent (perhaps even good) character generator, a line draw program, and an intriguing sine-wave addition program (very pretty). Also on the tape were other more mundane programs such as *Life*, *Bubblesort*, *Evolution*, and *Monte Carlo*. Easily the best value for money of all cassettes — it's free — and not bad either.

Supplier	Program	Comment	Price
Bug-Byte, 98-100 The Albany, Old Hall Street, Liverpool	*Spectral Invaders*	Standard	£5
Artic Computing, 396 James Reckitt Avenue, Hull	*Spectrum Bug*	Useful utility	£6.95
Simon W Hessel Software, 15 Lytham Court, Cardwell Crescent, Sunninghill, Berks	*Inheritance*	Poorly written	£5.95
Campbell Systems, 15 Rous Road, Buckhurst Hill, Essex	*SPDE* *Gulpman*	Useful utility An extraordinarily good program	£5.95 £5.95
Lomax 25 Parkway Crowthorne, Berkshire	*Defender* *Squash* *Thezeus*	Average	£4.50 for the three
ZX-Guaranteed, 29 Chadderton Drive, Unsworth, Bury, Lancs	*Venture*	Thinks it's a ZX81 program	£6
Psion, Sinclair Research	*Horizons*	Excellent value	Free with Spectrum
Abacus Programs, 186 St Hellens Ave, Swansea, West Glamorgan	*Destroyer* *Battle* *Iceberg* *Android/ Pit-rescue*	Subchase Tankchase Grippingly tedious And again	£4.95 £4.95 £5.95 for the two
Supersoft, 6a Newlands Ave, Southampton	*Editor* *Lgame* *Graphics*	Must be joking at this price Poor Free in *Horizons*	£15 £5 £5

Gulpman

Gulpman is the one cassette that I would buy (given that Horizons is free). In *Gulpman* you go round picking up apples while being chased by nasties. You are protected only by lasers and your wits. You have nine lives.

It is possible to choose between nine speeds, nine "grades" (how fast the nasties are compared to you) and 15 different mazes (each requiring a different strategy). You can also choose which keys control your movements.

You can run a demonstration on any type of maze, and save that version of the game with *your* keys, plus reset high-score and other twiddly bits. An exceptional program. Given the work involved and the way the whole program is packaged it is well worth the £6 — and I do not often think that.

Summary

When are software writers going to realise that the Spectrum is a different machine from the ZX81? And when will people stop re-using all the same old ideas? Apart from the two disassemblers, only Gulpman and Horizons really stand out.

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Open Forum is for you to publish your programs and ideas.
It is important that your programs are bug free before you send them in. We cannot test all of them.
Contributions should be sent to: Popular Computing Weekly, *Hobhouse Court, 19 Whitcomb Street, London WC2H 7HF.*

How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs. (The usual fee is £10.)

Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette.

The program will be well documented, the documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down on to white paper, avoiding any creasing.

Please enclose a stamped, self-addressed envelope.

Bricks

on ZX81

In this game for a 16K ZX81 84 bricks are placed across the base of the screen and they have to be removed by bombing them from a craft which moves backwards and forwards across the top. The speed of this craft is set by the player from fairly slow to very fast indeed. The speed of the game is achieved by writing the majority of the game in machine code.

If a brick is missed — and it becomes harder and harder to hit a brick as the number diminishes — the rows of bricks advance towards the top of the screen. Your mission is to destroy all the bricks before they reach the top.

Program notes

Line 1 is the REM statement which contains all the machine code.
Lines 130 to 155 set up the instructions on the screen and set the speed of the game from the player's instructions
Lines 160 to 250 set up the game on the screen
Lines 260 to 300 is the game loop itself
Lines 510 to 595 are reached if the bricks reach the top of the screen
Lines 600 onwards are reached if the entire wall is demolished and it then tells you how many shots were on target and invites you to play again (this invitation is also extended if you do not succeed)
GOTO 1000 can be used to save the program, and it will then run immediately upon subsequent loadings.

```
TO ENTER THE MACHINE CODE PART
OF THE PROGRAM USE A REM STATE-
MENT AT LINE ONE (MAKE SURE THE
REM HAS SOME 260 CHARACTERS
AFTER IT).  THE FULL HEX LOAD
PROGRAM SHOULD LOOK LIKE:

   1 REM XXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
 10 PRINT "TYPE IN THE NUMBER O
F BYTES TO  BE INSERTED"
 15 INPUT I
 20 CLS
 30 FOR X=16514 TO 16514+I
 40 LET Y=INT (PEEK X/16)
 50 SCROLL
 60 PRINT X;TAB 10;CHR$ (Y+28);
CHR$ (PEEK X-16*Y+28);
 70 INPUT A$
 80 IF A$="" OR LEN A$<2 THEN G
OTO 110
 90 IF CODE A$<28 OR CODE A$(2)
<28 OR CODE A$>43 OR CODE A$(2)>
43 THEN GOTO 110
 100 POKE X,16*CODE A$+CODE A$(2
)-476
 105 PRINT TAB 15,A$
 110 NEXT X


RUN THIS PROGRAM TO ENTER THE
MACHINE CODE SHOWN IN THE NEXT
COLUMN.  WHEN COMPLETE DELETE
ALL OF THE  HEX LOAD PROGRAM
EXCEPT LINE ONE.
THE FULL PROGRAM CAN NOW BE
ENTERED AS BELOW:
 130 CLS
 132 PRINT TAB 13;"BRICKS";TAB 1
3;"▀▀▀▀▀▀"
 135 PRINT ,,,,,,"DEMOLISH AS MA
NY BRICKS AS YOU  CAN BY PRESSIN
G ANY KEY WHEN YOUWANT TO FIRE."
 136 PRINT ,,"EACH TIME YOU MISS
 THE BRICKS  MOVE UP ONE LINE -
YOU HAVE TO  STOP THEM REACHING
 THE TOP...."
 137 PRINT ,,,,"TYPE IN THE SPEE
D OF CRAFT FROM 1 TO 5",,,TAB 2
;"1 IS SLOW";TAB 2;"4 IS FAST";T
AB 2;"5 IS IMPOSSIBLE"
 139 LET A$=INKEY$
 140 IF A$="" THEN GOTO 139
 145 IF CODE A$<29 OR CODE A$>33
 THEN GOTO 139
 150 LET S=VAL A$
 155 POKE 16605,21-4*S
 160 CLS
 200 POKE 16615,0
 210 FOR X=1 TO 14
 220 FOR Y=11 TO 19 STEP 4
 230 PRINT AT Y,X*2;" ▀";AT Y+1,
X*2;"▀"
 240 NEXT Y
 250 NEXT X
 260 PRINT AT 0,0;" ▀"
 270 POKE 16514,0
 280 LET L=USR 16515
 290 IF L THEN GOTO 500
 294 FOR Y=1 TO 10
 296 NEXT Y
 300 GOTO 260
 500 IF L=100 THEN GOTO 600
 510 FOR X=1 TO 5
 520 LET G=USR 16725
 530 FOR Y=1 TO 5
 540 NEXT Y
 550 NEXT X
 590 PRINT AT 19,4;" FAILED....
"
 595 GOTO 700
 600 LET G=USR 16753
 605 PRINT AT 10,7;" CONGRATULAT
IONS "
 610 PRINT AT 20,0;INT (84000/(8
4+PEEK 16615));" PERCENT OF S
HOTS ON TARGET "
 700 PRINT AT 21,0;"ANOTHER GAME
?"
```

BRICKS

THE FOLLOWING HEX CODES NEED TO BE ENTERED USING THE HEX LOAD PROGRAM. THE LOCATION TO WHICH THE CODE IS ENTERED IS SHOWN EVERY TWENTY BYTES. (READ THE LINES OF CODE ACROSS THE PAGE.)

```
16514
00    3A    82    40    3C
FE    1E    30    15    ED
55    0C    40    21    20
00    19    54    5D    2B

16534
01    1F    00    ED    B8
32    82    40    18    19
ED    5B    0C    40    21
01    00    19    54    5D

16554
23    01    1F    00    ED
B0    FE    3A    20    02
3E    00    32    82    40
CD    BB    02    2C    28

16574
1D    2A    0C    40    3A
82    40    FE    1E    30
04    C6    02    18    04
4F    3E    3C    91    06

16594
00    4F    09    22    E8
40    0E    21    18    0E
0E    05    06    FF    10
FE    0D    28    9E    18

16614
F7    00    00    00    1E
14    09    7E    36    17
06    FF    10    FE    FE
80    28    34    1D    20

16634
F1    1E    14    2A    E8
40    06    00    0E    21
09    36    00    1D    20
FA    3A    E7    40    3C

16654
32    E7    40    2A    0C
40    54    5D    01    21
00    09    01    B5    02
ED    B0    2A    0C    40

16674
23    06    00    0E    20
3E    80    ED    B1    C9
3E    15    93    2A    E8
40    06    00    0E    21

16694
09    36    00    3D    20
FA    2A    E8    40    36
00    2A    0C    40    23
06    02    0E    D5    3E

16714
80    ED    B1    06    00
0E    00    C8    0E    64
C9    2A    0C    40    06
16    C5    06    20    23

16734
7E    FE    7F    38    04
DE    80    18    02    C6
80    77    10    F1    23
C1    10    EA    C9    0E.

16754
03    06    52    18    02
06    FF    3E    97    D7
10    FD    0D    20    F6
C9    3D    3D    3D    3D
```

```
710 INPUT A$
720 IF CODE A$<>51 THEN RUN
750 STOP
1000 SAVE "BRICK▀"
1010 RUN
```

THE CHARACTER IN LINE 260 IS AN INVERSE STAR

to next page

PROGRAM OF THE WEEK

```
ADDRESS   HEX   INSTRUCTION

16514     00    NOP-CRAFT MARKER
16515     3A    LD A,(16514) MOVE
16516     82                 CRAFT
16517     40
16518     3C    INC A
16519     FE    CP 30
16520     1E
16521     30    JR NC (+21)
16522     15
16523     ED    LD DE,(16396)
16524     5B
16525     0C
16526     40
16527     21    LD HL,32
16528     20
16529     00
16530     19    ADD HL,DE
16531     54    LD D,H
16532     5D    LD E,L
16533     2B    DEC HL
16534     01    LD BC,31
16535     1F
16536     00
16537     ED    LDDR
16538     B8
16539     32    LD (16514),A
16540     82
16541     40
16542     18    JR (+25)
16543     19
16544     ED    LD DE,(16396)
16545     5B
16546     0C
16547     40
16548     21    LD HL,1
16549     01
16550     00
16551     19    ADD HL,DE
16552     54    LD D,H
16553     5D    LD E,L
16554     23    INC HL
16555     01    LD BC,31
16556     1F
16557     00
16558     ED    LDIR
16559     B0
16560     FE    CP 58
16561     3A
16562     20    JR NZ (+2)
16563     02
16564     3E    LD A,0
16565     00
16566     32    LD (16514),A
16567     82
16568     40
16569     CD    CALL KSCAN
16570     68
16571     02
16572     2C    INC L
16573     28    JR Z (+29)
16574     1D
16575     2A    LD HL,(16396)
16576     0C
16577     40
16578     3A    LD A,(16514)
16579     82
16580     40
16581     FE    CP 30
16582     1E
16583     30    JR NC (+4)
16584     04
16585     C6    ADD A,2
16586     02
16587     18    JR (+4)
16588     04
16589     4F    LD C,A
16590     3E    LD A,60
16591     3C
16592     91    SUB C
16593     06    LD B,0
16594     00
16595     4F    LD C,A
16596     09    ADD HL,BC
16597     22    LD (16616),HL
16598     E8
16599     40
16600     0E    LD C,33
16601     21
16602     18    JR (+14)
16603     0E    LD C,5
16604     0E
16605     05
16606     06    LD B,255
16607     FF
16608     10    DJNZ (-2)
16609     FE
16610     0D    DEC C
16611     28    JR Z (-98)
16612     9E
16613     18    JR (-9)
16614     F7
16615     00    NOP
16616     00    NOP
16617     00    NOP
16618     1E    LD E,20
16619     14
16620     09    ADD HL,BC
16621     7E    LD A,(HL)
16622     36    LD (HL)*
16623     17
16624     06    LD B,255
16625     FF
16626     10    DJNZ (-2)
16627     FE
16628     FE    CP 128  (■)
16629     80
16630     28    JR Z (+52)
16631     34
16632     1D    DEC E
16633     20    JR NZ (-15)
16634     F1
16635     1E    LD E,20
16636     14
16637     2A    LD HL,(16616)
16638     E8
16639     40
16640     06    LD B,0
16641     00
16642     0E    LD C,33
16643     21
16644     09    ADD HL,BC
16645     36    LD (HL),0
16646     00
16647     1D    DEC E
16648     20    JR NZ (-6)
16649     FA
16650     3A    LD A,(16615)
16651     E7
16652     40
16653     3C    INC A
16654     32    LD (16615),A
16655     E7
16656     40
16657     2A    LD HL,(16396)
16658     0C
16659     40
16660     54    LD D,H
16661     5D    LD E,L
16662     01    LD BC,33
16663     21
16664     00
16665     09    ADD HL,BC
16666     01    LD BC,693
16667     B5
16668     02
16669     ED    LDIR
16670     B0
16671     2A    LD HL,(16396)
16672     0C
16673     40
16674     23    INC HL
16675     06    LD B,0
16676     00
16677     0E    LD C,32
16678     20
16679     3E    LD A,128
16680     80
16681     ED    CPIR
16682     B1
16683     C9    RET
16684     3E    LD A,21
16685     15
16686     93    SUB E
16687     2A    LD HL,(16616)
16688     E8
16689     40
16690     06    LD B,0
16691     00
16692     0E    LD C,33
16693     21
16694     09    ADD HL,BC
16695     36    LD (HL),0
16696     00
16697     3D    DEC A
16698     20    JR NZ (-6)
16699     FA
16700     2A    LD HL,(16616)
16701     E8
16702     40
16703     36    LD (HL),0
16704     00
16705     2A    LD HL,(16396)
16706     0C
16707     40
16708     23    INC HL
16709     06    LD B,2
16710     02
16711     0E    LD C,213
16712     D5
16713     3E    LD A,128
16714     80
16715     ED    CPIR
16716     B1
16717     06    LD B,0
16718     00
16719     0E    LD C,0
16720     00
16721     C8    RET Z
16722     0E    LD C,100
16723     64
16724     C9    RET
16725     2A    LD HL,(16396)
16726     0C
16727     40
16728     06    LD B,22
16729     16
16730     C5    PUSH BC
16731     06    LD B,32
16732     20
16733     23    INC HL
16734     7E    LD A,(HL)
16735     FE    CP 127
16736     7F
16737     38    JR C,(+4)
16738     04
16739     DE    SBC A,128
16740     80
16741     18    JR (+2)
16742     02
16743     C6    ADD A,128
16744     80
16745     77    LD (HL),A
16746     10    DJNZ (-15)
16747     F1
16748     23    INC HL
16749     C1    POP BC
16750     10    DJNZ (-22)
16751     EA
16752     C9    RET
16753     0E    LD C,3
16754     03
16755     06    LD B,130
16756     82
16757     18    JR (+2)
16758     02
16759     06    LD B,255
16760     FF
16761     3E    LD A,■
16762     97
16763     D7    RST 10
16764     10    DJNZ (-3)
16765     FD
16766     0D    DEC C
16767     20    JR NZ (-10)
16768     F6
16769     C9    RET
```

Bricks
by Peter Vincent

Golf

on Spectrum

Golf, as the name implies, is a game which places you on a golf course generated by the computer. Your task is to get round the course in as few shots as possible by missing the bunkers, dodging the rivers and the trees, keeping out of the rough and putting accurately when you get close to the flag.

When the program is on the computer type *Run* to start and enter the number of holes that you wish to play. After a short pause you will be asked to enter your handicap (between 1 and 3). If you enter your handicap as 1 then you will be able to hit the ball further but you will also have longer holes and you will also have a smaller par.

If you choose a handicap of 3 you will have slightly shorter holes and you will have a larger par but you will not be able to hit the ball as far. When you have entered your handicap the hole will be displayed using the following symbols: the flashing T on the left is the Tee; the dark green (a chess board character of black and green) is the rough and landing in this will decrease the strength of your shot considerably.

The light green in the centre (a chess board character of cyan and green) is the fairway; the light green square on the right is the green with the flag in the centre; the black objects dotted about are trees and hitting one of these costs a penalty shot.

The yellow and black characters are bunkers and landing in one of these causes the strength of your shot to be cut considerably.

The blue characters are lakes and landing in one of these costs a penalty shot. The distance across the screen is displayed in yards in the top left. The par for the hole is displayed in the centre at the top and the number of shots you have taken is at the top on the right (if you have had any).

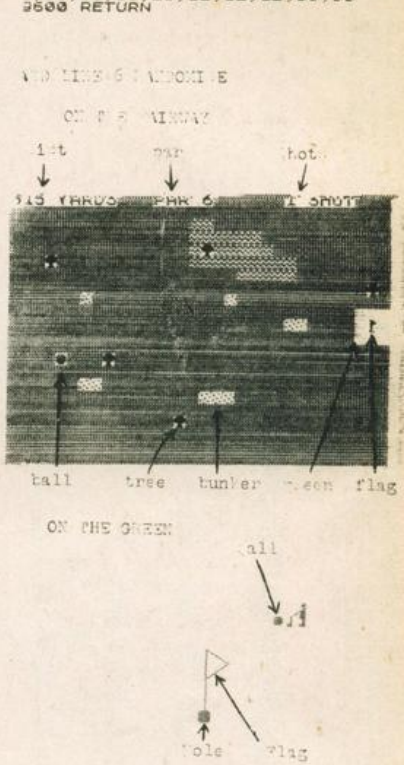
You are then asked to enter the strength of your shot (in yards), the direction of your shot (this is like a clock, eg 12 is up, 3 is right, 6 is down, etc, decimals, eg 1.5, are allowed), the computer then works out where your shot landed. **turn to next page**

from previous page

```
    GOLF
 S.GOODSON    AUGUST  82

This was written on a
48K SPECTRUM but the program
will run on a 16K version


   1 REM       GOLF
   2 REM  S.GOODMAN  AUGUST 82
   4 LET TP=0: LET H=0
   5 INPUT "HOW MANY HOLES ";TH
  10 GO SUB 9500
  20 LET C$=""
  30 LET B$=CHR$ 150+CHR$ 150+CH
R$ 150
  50 FOR F=1 TO 6: LET C$=C$+CHR
$ 146: NEXT F
  90 INPUT "ENTER HANDICAP (1 TO
          1 IS BEST  3 IS WOR
ST ";HC
  95 IF HC<1 OR HC>3 THEN GO TO
 90
 100 OVER 0: PAPER 7: CLS
 104 FOR F=1 TO 704: PRINT INK 0
 PAPER 4;CHR$ 144;: NEXT F
 105 FOR I=2 TO 28 STEP 2
 110 LET L=5+5*RND
 120 FOR J=L TO 11+5*RND
 130 PRINT AT J,I; INK 5; PAPER
4;CHR$ 144;CHR$ 144
 140 NEXT J
 150 NEXT I
 160 LET O=37
 170 LET YD=INT (RND*500)+100-(H
C*25)
 175 LET P=INT (YD/200+HC+2)
 180 LET CD=YD/32
 190 LET SH=0
 195 LET R=0
 200 FOR G=1 TO 2
 210 LET L=INT (RND*22): LET I=I
NT (RND*16)
 220 FOR F=0 TO INT (RND*4)
 230 PRINT AT I+F,L; INK 1;C$( T
O 2+INT (RND*5))
 240 NEXT F
 250 NEXT G
 300 FOR F=1 TO 6: PRINT AT RND*
20,RND*30; INK 0; PAPER 7;CHR$ 1
45: NEXT F
 310 FOR F=1 TO 5: PRINT AT RND*
20,RND*26; PAPER 6; INK 0; BRIGH
T 1;B$( TO INT (RND*4)): NEXT F
 350 LET HY=INT (RND*14+3)
 360 PRINT AT HY-1,29; PAPER 4;
BRIGHT 1; INK 4;"
 370 PRINT AT HY,29; PAPER 4; BR
IGHT 1; INK 4;"  "; INK 0;CHR$ 14
8; INK 4;""
 380 PRINT AT HY+1,29; PAPER 4;
BRIGHT 1; INK 4;"
 390 LET X=INT (RND*2+1): LET Y=
INT (RND*19+1)
 400 PRINT AT Y,X; FLASH 1;"T"
 410 PRINT AT 0,0;YD;" YARDS"
 415 PRINT AT 0,12;"PAR ";P
 420 GO SUB 9000
 430 IF O=32 THEN LET R=1: PRINT
 AT 21,0; INK 2; FLASH 1;"IN THE
 ROUGH"
 440 IF O=57 THEN LET SH=SH+1: P
RINT AT 21,0; INK 2; FLASH 1;"RI
VER PENALTY SHOT";AT Y,X; INK 1;
 PAPER 7;CHR$ 147
 450 IF X=30 AND Y=HY THEN LET S
H=SH+1: GO TO 8000
 460 IF O=100 THEN LET SH=SH+1:
GO TO 8500
 470 IF O=112 THEN LET R=1: PRIN
T AT 21,0; INK 2; FLASH 1;"IN TH
E BUNKER"
 480 IF O=56 THEN LET SH=SH+1: P
RINT AT 21,0; INK 2; FLASH 1;"TR
EE PENALTY SHOT"
 481 LET SH=SH+1
 485 PRINT AT 0,23;SH;" SHOT"+("
S" AND SH>1)
 490 GO TO 420
 8000 PAUSE 250: PAPER 7: CLS
 8010 PRINT "YOU TOOK ";SH;" SHOT
S FOR A PAR ";P;" HOLE WHICH IS
 "
 8015 IF SH=1 THEN PRINT FLASH 1;
"A HOLE IN ONE!"
 8020 IF SH-P<>0 THEN PRINT ABS (
SH-P);
 8025 IF SH<P THEN PRINT " UNDER
PAR"
 8030 IF SH>P THEN PRINT " OVER P
AR"
 8040 IF SH=P-1 THEN PRINT " A BI
RDIE."
 8050 IF SH=P-2 THEN PRINT " AN E
AGLE."
 8060 IF SH=P-3 THEN PRINT " AN A
LBATROS"
 8070 IF SH<P-3 THEN PRINT " BRIL
LIANT"
 8080 IF SH=P THEN PRINT " A PAR"
 8090 LET TP=TP+(SH-P)
 8100 PRINT '"YOU ARE NOW ";ABS
TP;(" OVER PAR" AND TP>0);(" UND
ER PAR" AND TP<0);(" PAR" AND TP
=0)
 8110 LET H=H+1
 8120 IF TH=H THEN PRINT "YOU HAV
E NOW COMPLETED THE","COURSE"'"G
OOD-BYE": STOP
 8200 PRINT '"PRESS ANY KEY"
 8499 PAUSE 0: GO TO 100
 8500 PAPER 4: CLS
 8510 PRINT AT 11,15;CHR$ 151
 8511 PLOT 132,88: DRAW 0,40: DRA
W 15,-10: DRAW -15,-10
 8514 LET O=0
 8515 IF Y>HY-.5 AND Y<HY+.5 THEN
 LET O=9
 8520 LET Y=INT (RND*6)+INT (RND*
9)+(15 AND Y)H/+.5)
 8530 LET X=INT (RND*10)+(INT (RN
D*12 AND (X>28.5 AND X<29.5)))+(1
30 AND X>29.5)
 8540 PRINT AT Y,X;CHR$ 149
 8541 IF X<29 AND Y>2 THEN PRINT
 OVER 1;AT Y,X+1;CHR$ 154;CHR$
155;AT Y-1,X+1;CHR$ 152;CHR$ 153
 8545 LET SH=SH+1
 8550 INPUT "STRENGTH (1 TO 32)";
S$
 8560 IF S$<"0" OR S$>":" THEN G
O TO 8550
 8570 LET S=VAL S$
 8580 IF S>32 THEN GO TO 8550
 8590 INPUT "DIRECTION (0 TO 12)"
;D$
 8600 IF D$<"0" OR D$>":" THEN G
O TO 8590
 8610 LET D=VAL D$: IF D>12 THEN
GO TO 8590
 8620 LET D=D*(PI/6)
 8625 PRINT AT Y,X; OVER 1;CHR$ 1
49
 8626 IF X<29 AND Y>2 THEN PRINT
; OVER 1;AT Y,X+1;CHR$ 154;CHR$
155;AT Y-1,X+1;CHR$ 152;CHR$ 153
 8630 LET X=INT (X+S*SIN D)
 8640 LET Y=INT (Y-S*COS D)
 8645 IF X>31 THEN LET X=31
 8646 IF X<0 THEN LET X=0
 8647 IF Y<0 THEN LET Y=0
 8648 IF Y>21 THEN LET Y=21
 8650 PRINT AT Y,X; FLASH 1;CHR$
149
 8660 IF X=16 AND Y=11 THEN GO TO
 8000
 8670 GO TO 8541
 9000 INPUT "STRENGTH (1 TO ";7+4
-HC)*50+100);" ) ";S$
 9001 IF S$<"0" OR S$>":" THEN G
O TO 9000
 9002 LET S=VAL S$
 9005 IF S>(4-HC)*50+100 THEN G
O TO 9000
 9007 LET S=S/CD
 9008 IF R=1 THEN LET S=S/(RND*2+
1.5)
 9010 INPUT "DIRECTION (0 TO 12)"
;D$
 9011 IF D$<"0" OR D$>":" THEN G
O TO 9010
 9012 LET D=VAL D$
 9015 IF D>12 OR D<0 THEN GO TO 9
010
 9020 PRINT AT Y,X;
 9030 IF O=32 THEN PRINT INK 0; P
APER 4;CHR$ 144
 9040 IF O=37 THEN PRINT INK 5; P
APER 4;CHR$ 144
 9050 IF O=57 THEN PRINT INK 1; P
APER 7;CHR$ 146
 9060 IF O=112 THEN PRINT INK 0;
PAPER 6;CHR$ 150
 9070 IF O=56 THEN PRINT INK 0; P
APER 7;CHR$ 145
 9080 LET D=D*(PI/6)
 9090 LET XI=X+S*SIN D
 9100 LET YI=Y-S*COS D
 9101 IF YI>21 OR YI<0 THEN LET S
H=SH+1: PRINT AT 21,0; INK 2; FL
ASH 1;"LOST BALL PENALTY SHOT":
GO TO 9110
 9102 IF XI>31 OR XI<0 THEN LET S
H=SH+1: PRINT AT 21,0; INK 2; FL
ASH 1;"LOST BALL PENALTY SHOT":
GO TO 9110
 9103 LET X=XI: LET Y=YI
 9110 LET X=INT (X+.5): LET Y=INT
 (Y+.5)
 9115 LET O=ATTR (Y,X)
 9120 PRINT AT Y,X; FLASH 1;CHR$
149
 9140 LET R=0
 9185 FOR F=1 TO 250: NEXT F
 9190 PRINT AT 21,0;: FOR F=1 TO
22: PRINT INK 0; PAPER 4;CHR$ 14
4;: NEXT F
 9200 RETURN
 9499 STOP
 9500 RESTORE 9500
 9505 FOR F=144 TO 155
 9510 FOR G=0 TO 7
 9520 READ A
 9530 POKE USR CHR$ F+G,A
 9540 NEXT G
 9550 NEXT F
 9560 DATA 85,170,85,170,85,170,8
5,170,60,126,255,255,126,24,24,6
0,66,170,17,68,170,17,68,170
 9570 DATA 129,60,66,90,90,66,60,
129,24,28,24,16,16,16,16,56,0,60
,126,126,126,126,60,0
 9580 DATA 128,64,32,16,8,64,32,16,1
28,255,255,255,255,255,255,255,128
 9590 DATA 0,0,0,0,0,0,0,0,3,28,28,
28,12,28,60,220,60,4,8,8,0,8,8,8
 8,56,60,60,28,12,12,12,60,60
 9600 RETURN
```



Golf
by Simon Goodson

Alien Invaders

on ZX81

Alien Invaders is a fast, addictive moving graphics game for the expanded ZX81 in which you are under siege from invading craft from outer space. As they move across the screen you have to try and shoot them down using your laser bases which you can move to the left and right using the 2 and 4 keys.

To fire press the 9 key. Try and hit them as quickly as possible as you'll score more if you do. But watch out though, the aliens can drop bombs as well.

These are the main sections of the program and their purposes:

Lines 1-31 Variables
Lines 50-94 Set up screen
Lines 100-160 Main program routine
Lines 200-240 Alien crossed screen
Lines 300-390 Firing routine
Lines 400-470 Direct hit on alien
Lines 1000-1200 Your base has been hit
Lines 1500-1550 End of game

Explanation of variables:

K	—Best score
C	—Number of lives
S	—Score
A & B	—Position of alien
X & Y	—Your position

Data/Read

on ZX81

The idea is that data is stored in a string, and the string read by the ZX81 string-slicing routines. The data-string is then reduced by the number of digits read.

In the example, the variable D$ is initialised at the start of the program by a GOSUB 1000; this data-string is then read two digits at a time — (2000 LET R$=D$(TO 2)) — and is then reduced in length by those two digits — (2010 LET D$=D$(3 TO)).

The resulting R$ is then converted to a numeral by use of VAL. In using this routine, it is essential that all data items are the same length; in the case of numerals, they should be padded out with leading zeros, and non-numerics with trailing spaces. Restore is simply a GOSUB 1000, which redefines D$ to its original length.

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```
  0 REM I.BEYNON:-COPYRIGHT 82
  7 LET N=0
  8 LET C=3
  9 LET S=0
 10 LET A=2
 11 LET X=20
 30 LET B=0
 31 LET Y=12
 50 PRINT AT 21,0;"
 90 PRINT AT 0,3;"YOUR SCORE=";
S
 91 IF C=3 THEN PRINT AT 0,21;"
 92 IF C=2 THEN PRINT AT 0,21;"
 93 IF C=1 THEN PRINT AT 0,21;"
 94 PRINT AT 1,3;"BEST SCORE=";
K
 100 FOR B=0 TO 27
 101 PRINT AT A,B;" ";AT X,Y
;"
 102 LET I=INT (RND*6)
 103 IF I<>3 THEN GOTO 114
 104 FOR N=7 TO 19 STEP 4
 105 IF N<>7 THEN PRINT AT N-4,B
+2;"
 106 PRINT AT N,B+2;"V"
 110 NEXT N
 111 IF B+2=Y+3 OR B+2=Y+4 OR B+
2=Y+2 THEN GOTO 1000
 113 PRINT AT 19,B+2;"
 120 IF INKEY$="2" AND Y>1 THEN
LET Y=Y-2
 140 IF INKEY$="4" AND Y<27 THEN
LET Y=Y+2
 150 IF INKEY$="9" THEN GOSUB 30
0
 160 NEXT B
 200 CLS
 210 PRINT AT 10,3;"ALIEN CRAFT
SUCCESSFULLY          CROSSED
SCREEN"
 215 LET C=C-1
 220 FOR N=1 TO 100
 230 NEXT N
 235 CLS
 240 GOTO 1050
 300 FOR N=17 TO 2 STEP -3
 310 IF N<>17 THEN PRINT AT N+3,
Y+3;"
 320 PRINT AT N,Y+3;"A"
 330 NEXT N
 340 PRINT AT 2,Y+3;"
 350 IF Y+3=B+1 OR Y+3=B+2 OR Y+
3=B+3 THEN GOTO 400
 390 RETURN
 400 FOR N=1 TO 10
 410 PRINT AT 10,12;" BOOM ";AT
10,12;"      "
 430 NEXT N
 440 PRINT AT 2,B+1;"
 450 PRINT AT 20,Y+3;"
 455 PRINT AT 2,0;"
 456 PRINT AT 10,0;"
 460 FOR N=1 TO 10
 465 NEXT N
 467 LET S=S+(32-B)
 470 GOTO 90
1000 PRINT AT 19,B+2;"
1010 FOR N=1 TO 20
1020 PRINT AT X,Y;"      ";AT X
,Y;"
1030 NEXT N
1066 FOR N=1 TO 20
1065 NEXT N
1075 LET C=C-1
1080 IF C=0 THEN PRINT AT 0,28;"
1190 IF C=0 THEN GOTO 1500
1195 PRINT AT 2,0;"
1200 GOTO 50
1500 CLS
1510 PRINT AT 10,0;"YOU MANAGED
TO SCORE ";S;" POINTS"
1520 PRINT AT 17,2;"PRESS ANY KE
Y TO PLAY AGAIN"
1525 IF S>K THEN LET K=S
1530 IF INKEY$="" THEN GOTO 1530
1540 CLS
1550 GOTO 8
```

Alien Invaders
by Ian Benyon

```
   1 REM EXAMPLE OF DATA/READ
   2 REM ON ZX81-R K A PHILLIPS
   3 DIM R(10)
   4 DIM C(10)
   5 DIM A(10)
  10 GOSUB 1000
  15 FOR I=1 TO 10
  20 GOSUB 2000
  25 LET R(I)=VAL R$
  30 LET C(I)=INT (2*PI*R(I)*10+
.5)/10
  40 LET A(I)=INT (PI*R(I)**2*10
+.5)/10
  50 NEXT I
  60 PRINT "RADIUS";TAB 10;"CIRC
UM";TAB 20;"AREA"
  70 FOR I=1 TO 10
  80 PRINT R(I);TAB 10;C(I);TAB
20;A(I)
  90 NEXT I
  99 STOP
 999 REM DATA STRING IS D$
1000 LET D$="2739172973653861486
2"
1009 REM NB ALL SAME LENGTH
1010 RETURN
1999 REM READ BY R$
2000 LET R$=D$( TO 2)
2010 LET D$=D$(3 TO )
2019 REM VARY BY LENGTH OF DATA
2020 RETURN
```

```
RADIUS      CIRCUM      AREA
27          169.6       2290.2
39          245         4776.4
17          106.8       907.9
26          162.2       2642.1
73          456.7       16741.5
85          534.1       22698
38          238.8       4536.5
61          383.5       11589.9
48          301.6       7238.2
99          433.5       14957.1
```

Data/Read
by Robin Phillips

UFO

on Atom

The object of the game is to shoot down UFOs which randomly move around the screen. When you hit them they explode.

If you have a 6522 Via on your Atom, you can hear the sound effects by fixing a speaker (via a driver) to CB2 (pin 11 on PL6). If you wish to create your own sounds it is very simple; only 3 pokes are needed:

Line 1;?£B80B=16
Line 2;?£B80A= any No. from 1 to 255 (square wave mark space ratio)
Line 3;?£B808= any No. from 1 to 255 (frequency)

String Sort

on ZX81

String Sort is a useful routine which will sort words or even full sentences into alphabetical order. This can be very handy when a long list of people's names need to be used for a list such as a register of members at the local computer club.

The program runs on a 16K ZX81 and output can easily be sent to the ZX printer by using the sequence *Break*, *Copy*, *Cont* at any time when a copy of the screen contents is desired (except during an *Input*).

As you would expect, the string inputs are stored in a string array, which is two-dimensional. The program asks you how many words you have and what the maximum length of the word/sentence is. These are both maximum limits, so if you don't know how many or how long your strings are then it is usually a good idea to be generous when you estimate your answers to the two questions.

If at any time you have finished entering your list of words but the computer is waiting for the next word, then input the keyword *Stop* as instructed by the program, and the computer will go into *Fast* mode while it sorts the strings into order.

I have taken exceptional care over the screen presentation, with such nice effects as:

(1) If your word is more than one line long

turn to next page

```
 0 P.$I2" UFOufoUFOufoUFOufoUFOufoUFOufo"'
 I P." ******************************"
 2 P.''"THE OBJECT OF THE GAME IS TO     MOVE
THE UFO INTO "
 3 P."YOUR SIGHTS    AND SHOOT IT DOWN"''
 4 P."YOU HAVE 20 SHOTS WITH WHICH TO DO THIS"'
 5 P."CTRL=UP:SHIFT=DOWN:Q=LEFT:"'"3=RIGHT:G=
FIRE"''
 6 P."       (PRESS A KEY)";LINK£FFE3
 I0 S=0
 20 B=20
 30 ?£B80B=I6
 40 DIM AA8,BBI4
 50 T=0
 60 AA0=2I9;AAI=36;AA2=I26;AA3=255;AA4=I29
 90 CLEARI
 I00 MOVE64,0;DRAW64,64
 II0 MOVE0,32;DRAWI28,32
 I20 Q=A.R.%I024+£8000
 I30 T=T+I
 I40 F.X=0TO4;?Q=AA(X):?Q;Q=Q+I6;N.
 I50 Q=Q-80
 I60 ?£B80B=I6;?£B80A=I6;?£B808=A.R.%60+I00
 I70 F.X=0TO5;WAIT;N.;?£B80A=0
 I80 F.X=0TO4;?Q=AA(X):?Q;Q=Q+I6;N.;Q=Q-80
 I90 D=A.R.%3
 200 IF D=0 Q=Q-A.R.%3
 2I0 IF D=I Q=Q+A.R.%3
 220 IF D=2 Q=Q+A.R.%3*I6
 230 IF D=3 Q=Q+A.R.%3*I6
 240 IF ?£B00I=247 GOS.330
 250 IF ?£B00I=I9I Q=Q-(5*I6)
 260 IF ?£B00I=I27 Q=Q+(5*I6)
 270 IF ?£B00I=239 Q=Q-2
 280 IF ?£B00I=253 Q=Q+2
 290 IFB=0;P.$I2"    YOUR LASER ENERGY HAS NOW RUN OUT "
'''
 300IFT=300;P.$I2"    YOUR FUEL HAS NOW RUN OUT "'''
 3I0 IFT=300 OR B=0;P."YOUR SCORE WAS"S;LINK£FFE3;RUN
 320G.I40
 330 MOVE0,0:PLOT5,64,32;PLOT5,I28,0
 340 ?£B80A=33
 350 F.X=255TOO S.-I;?£B808=X;N.;B=B-I
 360 IFQ>£8200-(I6*3) AND Q<£8200+(I6*3);GOS.380
 ;S=S+I00:G.90
 370 MOVE0,0;PLOT7,64,32;PLOT7,I28,0;R.
 380 MOVE64,32;G=84;H=32
 390 DO G=G-4;H=H+4;DRAWG,H;MOVE64,32;U.G=64
 400 DO G=G-4;H=H-4;DRAWG,H;MOVE64,32;U.G=44
 4I0 DO G=G+4;H=H-4;DRAWG,H;MOVE64,32;U.G=64
 420 DO G=G+4;H=H+4;DRAWG,H;MOVE64,32;U.G=84
 430 F.X=0TO3
 440 ?£B80A=44;F.C=0TO75;?£B808=C;N.
 450 ?£B80A=44;F.C=I75TOO S.-I;?£B808=C;N.C
 460 N.;R.
 470 E.
 480 REM**(C)P.VERNON**I982**
```

UFO
by P Vernon

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on the screen, then the computer automatically puts in the four-space margin on the left-hand side of the screen, which is reserved for the number of the word (see lines 240-290).

(2) If your string is not of maximum length then the computer won't waste time printing out the remaining spaces of the array element in which the string is stored (see lines 250 and 530).

```
  100 PRINT "STRING SORT, (C)DAVI
D M. WEBB"
  110 PRINT '','"NUMBER OF WORDS=";
  120 INPUT N
  130 PRINT N
  140 PRINT '','"MAX LENGTH=";
  150 INPUT L
  160 PRINT L
  170 PRINT '','"TO EVALUATE EARLY
INPUT KEYWORD",,,"""" STOP """,,,
  180 DIM A$(N,L)
  190 FOR A=1 TO N
  200 IF PEEK 16442=2 THEN GOSUB
 660
  210 PRINT A;TAB 4;
  220 INPUT A$(A)
  230 IF A$(A,1)=" STOP " THEN GO
TO 540
  240 FOR F=1 TO L
  250 IF A$(A,F TO F+(F(L))="   "
THEN GOTO 300
  260 IF PEEK 16441=1 AND PEEK 16
442=3 THEN GOSUB 710
  270 IF PEEK 16441=1 THEN PRINT
TAB 4;
  280 PRINT A$(A,F);
  290 NEXT F
  300 PRINT
  310 NEXT A
  320 CLS
  330 FAST
  340 LET K=1
  350 IF CODE A$(K,1)=0 THEN GOTO
 380
  360 LET K=K+1
  370 IF K(=N THEN GOTO 350
  380 DIM B$(K-1,L)
  390 FOR A=1 TO K-1
  400 LET M=A
  410 LET B$(A)=A$(A)
  420 FOR C=1 TO K-1
  430 IF B$(A)>A$(C) THEN GOSUB 6
10
  440 NEXT C
  450 LET A$(M)=" COPY "
  460 NEXT A
  470 CLS
  480 SLOW
  490 FOR A=1 TO K-1
  500 IF PEEK 16442=2 THEN GOSUB
 660
  510 PRINT A;TAB 4;
  520 FOR F=1 TO L
  530 IF B$(A,F TO F+(F(L))="   "
THEN GOTO 560
  540 IF PEEK 16441=1 AND PEEK 16
442=3 THEN GOSUB 710
  550 IF PEEK 16441=1 THEN PRINT
TAB 4;
  560 PRINT B$(A,F);
  570 NEXT F
  580 PRINT
  590 NEXT A
  600 STOP
  610 LET B$(A)=A$(C)
  620 LET M=C
  630 RETURN
  640 LET A$(A)=""
  650 GOTO 330
  660 PRINT AT 0,19;"PRESS ANY KE
Y"
  670 IF INKEY$(>"" THEN GOTO 670
  680 IF INKEY$="" THEN GOTO 680
  690 CLS
  700 RETURN
  710 PRINT AT 0,19;"PRESS ANY KE
Y"
  720 IF INKEY$(>"" THEN GOTO 720
  730 IF INKEY$="" THEN GOTO 730
  740 CLS
  750 PRINT TAB 4;
  760 RETURN
```

String sort
by David Webb

Canyon

on BBC Micro

"Canyon" was developed on a BBC model B microcomputer. It has been compressed to run on the model A. However, there is insufficient memory available in the model A unless the space reserved for the user supplied resident routines between &D00 and &E00 is made available to this program.

If the command PAGE = &D00 is entered BEFORE loading the program "Canyon" will then run on the model A.

This program was developed from Road Runner by Tim Hartnell as published in *Popular Computing Weekly* April 20, 1982 vol. 1 No. 1. Substantial modifications and enhancements have been made.

The fleet is surrounded. There is only one chance. Someone must make it through the canyon to find reinforcements. Only a madman would venture through the narrow and treacherous canyon. As you no doubt qualify I will explain the controls. Use the cursor control keys to move left and right and the space bar to energise your laser.

Line 1 If escape is pressed goto average routine
Lines 2-3 Instructions
Lines 4-8 Initialisation
Lines 9-22 Main program section
Lines 23-28 Crash routine
Lines 29-43 Top 10 scores update and display routine
Lines 44-46 Display average and reset routine

I have got rather bored waiting for the BBC wordprocessor chip and so as a stopgap measure I have written a three-line wordprocessor for my Epson MX80 F/T printer. I keep this under the bit of plastic guarded by the BBC owl.

Line 10 MODE0
Line 20 VDU8:INPUT LINE" "I$
Line 30 VDU11,2:PRINTI$:VDU3:GOTO20

```
   24UNTIL U=0
   25M=(TIME DIV 10)/10-2.8
   26 S%=S%+1:T%=T%+M:VDU5
   27 MOVE0,1000:GCOL0,1:*FX15,1
   28PRINT" CRASHED AT ";M;" KM"''" YOU ZAPPED ";SC;" MINES"
   29X=TIME:REPEAT:UNTILTIME>X+300:MODE4:I%=0:SC=SC+M:REPEAT:I%=I%+1:
UNTIL SC>SC(I%) OR I%=10
   32IFSC<=SC(I%) GOTO39
   33VDU19,1,3,0,0,0:PRINT TAB(3,10)"YOUR SCORE IS IN THE TOP 10"'':
   *FX15,1 35INPUT"PLEASE TYPE YOUR NAME  "N$:SCC=I%:REPEAT:H=SC(I%):H$
   =N$(I%):SC(I%)=SC:N$(I%)=N$:SC=H:N$=H$:I%=I%+1:UNTIL I%=11:SC=SC(SCC)
   39CLS:PRINT''TAB(10)"THE TOP TEN SCORES ARE"
   40FORI%=1 TO10:PRINT TAB(4,I%*2+4);SC(I%);TAB(20,I%*2+4);N$(I%):NEXT
   I%:PRINT''''"      YOUR SCORE WAS "SC:*FX15,1
   43X=GET:UNTILFALSE
   44MODE4:VDU 31,0,15:PRINT"YOUR AVERAGE DISTANCE WAS ";((T%*100/S%)
   DIV 10)/10;";"IN ";S%;" RUNS"''"DO YOU WANT TO RESET THESE VALUES "
   :IF GET$="Y" THEN T%=0:S%=0
   46PRINT'' "   ....RESTART ? ":IF GET$<>"N" RUN ELSE*FX4,0
```

Canyon
by Peter Cassidy

Black Hole

on Vic 20

This is a Space Invader game with a difference. At any one time three invaders pass in front of you from the top of the screen each having a different score value, which you simply have to shoot. You can shoot the alien when it appears anywhere in the sight.

But beware, there are six invisible black holes in front of you. You will be sucked into the black hole when the centre of the sight passes over one of these holes.

A good average for the game is 100. All keyboard directions are shown in the instructions.

The program runs in a minimum of 6.5K and can also be used without any modification with any memory above that level.

```
1 REM  (C) 1982
2 REM N.ECKERSLEY
3 PRINT"J":GOSUB40000
4 PRINT"J":POKE36879,104
900 U=7922:SU=8164:SC=36864:S3=7791:S4=30720:S5=7707:S6=7812:S7=8120:S8=7680
901 IFPEEK(4096)<>32THENGOSUB20500
909 T=76:HC=0
995 SP1$="
1000 SHIP$=
1011 PRINT"J":PRINT"
1012 POKES1,160:POKES1+21,160:POKES2+21,7:POKES2,7
1020 T1$="000000":GOSUB1024:GOSUB1025
1022 FORS=1TO22:POKES5+1,69:NEXT:IFTV=99.99THENRETURN
1023 GOTO1022
1024 PRINT"
1025 PRINT"
1027 GOSUB6000
1028 GOSUB15000
2000 GETH$:POKE198,0
2001 IFT1$="000000"THEN30000
2005 IFH$=""THENFORH=1TO100:NEXT:GOTO2055
2010 IFH$="L"THENGOSUB1024:T=T+1:IFT>81THENT=81
2011 IFH$="L"THENGOSUB1025
2020 IFH$="J"THENGOSUB1024:T=T-1:IFT<66THENT=66
2021 IFH$="J"THENGOSUB1025
2030 IFH$="I"THENGOSUB5000:U=U-22:IFU<56+22THENU=56+22
2031 IFH$="I"THENGOSUB6000
2040 IFH$="M"THENGOSUB5000:U=U+22:IFU>57THENU=57
2041 IFH$="M"THENGOSUB6000
2050 IFH$="K"THENSH=SH+1:F=T+68-19:GOSUB7000
2055 TV=99.99:GOSUB15020:TV=0
2057 GOTO2000
5000 POKEU,32:POKEU+21,32:POKEU-22,32:POKEU-1,32:POKEU-44,32:POKEU-23,32:RETURN
6000 POKEU,76:POKEU+21,122:POKEU-44,79:POKEU-23,80:POKEU-22,101:POKEU-1,103:RET
URN
7000 GOSUB9000:GOSUB9002:F=F-22:GOSUB9000:GOSUB9002
7001 F=F+1:GOSUB9000:GOSUB9002:F=F+1:GOSUB9002:GOTO10000
7020 RETURN
9000 IFPEEK(F)=69THENGOSUB11000
9001 POKEF,46:POKEL+1TO50:NEXT:RETURN
9002 POKEF,32:RETURN
10000 FORF=FTO<U+22>STEP22:IFPEEK(F)<>32THENGOTO20000
10003 GOSUB9000:GOSUB9002:GOSUB15020
10005 NEXT
10006 AF=81:GOSUB10000:AF=87:GOSUB10000:AF=46:GOSUB10000:AF=32:GOSUB10000
10008 POKE36879,15:POKE36877,200:POKE36878,0:POKEF-22,AF:FORAA=1TO50:NEXT:RETUR
N
11000 TV=99.99:GOSUB1022:TV=0:F=F+22:RETURN
15000 SA=INT(RND(1)*15)+1:SB=0
15010 SU=53+(SA*2)
15011 IFT=99.99THENRETURN
15020 PRINT"HOME SUB";U;"SHOTS";SH
15021 POKESU,32:POKESU+1,32:POKESU+2,32:POKESU-21,32:POKESU+3,32
15022 IFT=99.99THENRETURN
15030 SB=SB+1:IFSB>16THEN15000
15035 SU=SU+1
15036 POKESU,98:POKESU+1,160:POKESU+2,98:POKESU+3,99:POKESU-21,113
15038 IFT=99.99THENRETURN
15040 RETURN
20000 IFP<>U-44THEN20010
20005 GOTO10003
20010 X=0:Y=1:SD=81:CD=2:GOSUB20500:SD=87:CD=5:GOSUB20500
20020 SD=46:CD=7:GOSUB20500:SD=32:CD=1:GOSUB20500:RETURN
20500 POKEF,SD:POKEF+1,SD:POKEF-1,SD:POKEF+22,SD:POKEF-22,SD
20510 POKEF+21,SD:POKEF+23,SD:POKEF-21,SD:POKEF-23,SD
20520 CE=544+F
20530 POKECE,CD:POKECE+1,CD:POKECE-1,CD:POKECE+22,CD:POKECE-22,CD
20540 POKECE+21,CD:POKECE+23,CD:POKECE-21,CD:POKECE-23,CD
20545 POKESU,32:POKESU+1,32:POKESU+2,32:POKESU+3,32:POKESU-21,32
20546 POKE36878,15:POKE36876,200:POKE36878,0:GOSUB30000:RETURN
20555 POKE36878,15:FORFE=255TO128STEP-1:POKE36877,FE:NEXT
20580 U=4338:S1=4580:S2=8037:S4=33792:S3=4207:S5=4103:S6=4228
20581 S7=4536:S8=4096:RETURN
26000 POKEAL,32:POKEAL-1,32:POKEAL+1,32:POKEAL-22,32:POKEAL-24,32:POKEAL-20,32
26001 RETURN
30000 PRINT"       TIME OUT!!!"
30010 PRINT"  YOU DESTROYED "SB
30020 PRINT"  ENEMY SUBMARINES"
30030 PRINT"PRESS SPACE FOR     ANOTHER GAME"
30040 GETH$
30050 IFH$<>" "THEN30040
30060 U=RZ:T=76:GOTO1011
40000 POKE36879,104
40010 PRINT"   INSTRUCTIONS."
40020 PRINT"  ------------"
40030 PRINT"THE AIM OF THE GAME ISTO DESTROY ENEMY     SUBMARINES"
40040 PRINT"FIRST YOU HAVE TO SET THE DEPTH AT WHICH THECHARGES WILL EXPLODE"
40070 PRINT"DEPTH INDICATOR"
40075 PRINT"INCREASE=M"
40076 PRINT"DECREASE=I"
40077 PRINT"SHIP MOVEMENT"
40078 PRINT"LEFT=J"
40079 PRINT"RIGHT=L"
40080 PRINT"FIRE=K"
40081 PRINT"PRESS  /KCE TO COIT"
40090 GETH$
40100 IFH$<>" "THEN40090
40110 PRINT"  CONTINUED."
40120 PRINT"  ---------"
40145 PRINT"YOU HAVE THREE MINS.  TO DESTROY AS MANY  U-BOATS AS POSSIBLE"
40150 PRINT"PRESS SPACE TO START"
40160 GETH$
40170 IFH$<>" "THEN40160
40180 RETURN
```

Black hole
by N Echersley

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1. *There is no limit on the number of entries you can send in, but each entry must be accompanied by four differently numbered competition coupons.*
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4

Breaking up is always hard to do

***David Hawkins** explains how to disassemble Z80 instructions into mnemonics.*

The ability of Sinclair Spectrum Basic to hold relatively complex data structures in a 'visible' form, ie, in the program listing, is well demonstrated by this Z80 disassembler. This is made possible by the new (to ZX Basic) commands: *Data* (with expressions as data), *Restore* (with a line-number pointer), *Read* and multi-statement lines for greater speed (less line-numbers for *Goto, Gosub, Return, Restore* etc to search through).

The program provides a disassembly of all Z80 instructions — indexed or otherwise — into mnemonics and, optionally into byte values (decimals and characters/keywords). Illegal instructions are *Beeped* and *Flashed,* whereupon the program goes into byte printing mode. *Jr* opcodes are printed with actual addresses. The program prints 2-3 lines a second.

The instruction relationships and mnemonics are held in *Data* statement tables as opcode (or pointer), arguments (or pointers) and brackets requirements. Some opcodes and arguments are contained in array tables, so certain *Data* lines hold pointers to the arrays — notice how an opcode can be built from two parts as in line 3271.

Each instruction byte is rearranged and split to form a pointer to a *Data* line. As certain instructions have a slightly different structure, the opcode is replaced where relevant by an indicator and pointer to a further line eg line 1001 points to line 4000 modified by variable *b.*

The lower-case letters *u* to *z* are used to indicate special editing requirements before output ie insert Index registers, calculate displacements, double byte values, etc.

The program automatically determines the number of bytes in the instruction so printing the correct number of byte values is simple.

Figure 1

```
45    RST  56
46    RST  56
47    RST  56
48    PUSH BC
49    LD   HL,(23649)
52    PUSH HL
53    JP   5790
56    PUSH AF
57    PUSH HL
58    LD   HL,(23672)
61    INC  HL
62    LD   (23672),HL
65    LD   A,H
66    OR   L
67    JR   NZ,72
69    INC  (IY+64)
72    PUSH BC
73    PUSH DE
74    CALL 703
77    POP  DE
78    POP  BC
Address Bytes Bobytes Continue
```

Variables used

a to *e*	— components of split byte.
f	— index register displacement.
g	— indicates which argument is bracketed (0 = none) also used for byte printing.
i	— used for index instruction validation.
k	— indicates instruction classification.
l	— instruction block pointer.
m	— modifies 1 pointer, also indicates which argument is being edited.
p	— address of byte being examined.
p'	— address of first byte of instruction.
q	— contents of byte being examined.
s	— indicates if byte values are to be printed, 0 = no, 1 = yes.
z	— Table initialisation *For* loop counter.
a$ to *c*$	— opcode and two arguments.
d$	— holds arguments for editing.
h$	— holds "HL", "IX" or "IY" as required.
n$	— contains flashing "?" for errors.
o$ to *y*$	— Mnemonic tables.
z$	— holds "+" or null for index register displacement.

Detailed Description

1	Print title, set Caps Lock and initialise.

Main program

100	Input start address.
110	Get first byte, set class and index defaults.
120	'*Halt* opcode.
130	Determine class of instruction.
150-180	Index instructions.
200	Split byte and rearrange, set *Data* pointer to line and *Read* first item.
230	If extended structure read next two items (line no and modifier), reset *Data* pointer and read item.
240	Check for invalid opcode.
250	Read two arguments and brackets indicator.
260-270	Check/edit both arguments.
280	If index instruction check if index editing was done.
300-310	Insert brackets if necessary.
700	Print disassembled instruction.
720	Print byte values if required.
740	Check for interrupt.

Argument editing

920	"*u*" — displaced address.
930	"*v*" — single byte value.
940	"*w*" — double byte value.
945	"↑" — invalid argument.
950	Set index edit flag.
955	"*y*" — index register.
960-990	"*x*" — index register and displacement.

Tables

1001-1371	Instruction byte not equal 203 or 237.
2071-2371	Instruction byte = 203.
3071-3371	Instruction byte = 237.
4001-4048	Extended instructions.

Miscellaneous

4500-4560	Handle interrupts.
4900-6000	Determine mode and set up mnemonic arrays.

When the program is *Run* it will ask if byte values are to be printed — press B (bytes to be printed) or N (not printed). Next, it will ask for a start address for disassembly. Printing will continue until a key is pressed. The options are: A — new address, B — byte values, N — no byte values or C — continue.

Figure 1 shows the output address and mnemonics only, Figure 2 shows address, mnemonics and byte values. Figure 3 contains the program listing.

Figure 2

```
4605  INC  B          4   ?
4606  JR   Z ,4633    40  (
                      25  ?
4608  LD   (23732),HL
                      34  "
                      180 TAN
                      92  \
4611  LD   DE,16047   17  ?
                      175 CODE
                      62  >
4614  LD   BC,168     1   ?
                      168 FN
                      0   ?
4617  EX   DE,HL      235 FOR
Address Bytes Bobytes Continue
```

Possible enchancements

Use a 16K array to map and disassemble the Rom, marking addresses of *Calls, Jps,* etc. Follow only these established instruction addresses in the disassembly. Place these symbolics into a large array and write with address array to Microdrive files for subsequent searching/editing. Symbolic names can be given to many addresses eg system variables and commonly used subroutines.

Next requirement — editor/assembler. Watch this space!

```
  1 PRINT AT 5,5;"Spectrum Disa
ssembler": POKE 23658,8: GO SUB
4900
 100 INPUT " Start address ? ";p
 110 LET p1=p: LET q=PEEK p: LET
 p=p+1: LET k=1: LET i$="HL"
 120 IF q=118 THEN LET a$="HALT"
: LET b$="": LET c$="": GO TO 70
0
 130 IF q=203 OR q=237 THEN LET
k=2+(q=237): LET q=PEEK p: LET p
=p+1: GO TO 200
 150 IF q=221 THEN LET i$="IX"
 160 IF q=253 THEN LET i$="IY"
 170 IF i$<>"HL" AND PEEK p=118
THEN GO TO 850
 180 IF i$<>"HL" THEN LET q=PEEK
 p: LET p=p+1: IF q=203 THEN LET
 k=2: LET f=PEEK p: LET p=p+1: L
ET q=PEEK p: LET p=p+1
 200 LET a=INT (q/64): LET b=INT
 (q/8-a*8): LET c=q-b*8-a*64: LE
T d=INT (b/2)+1: LET e=b-2*d+3:
LET a=a+1: LET b=b+1: LET c=c+1:
 RESTORE k*1000+a*100+c*10+e-111
: READ a$
 230 IF a$=">" THEN READ l,m: RE
STORE l+m: READ a$
 240 IF a$(1)="↑" OR a$(LEN a$)=
"↑" THEN GO TO 850
 250 READ b$,c$,g
 260 LET i=0: IF CODE b$>90 THEN
 LET d$=b$(1): LET m=1: GO SUB 9
00: LET b$=d$
 270 IF CODE c$>90 THEN LET d$=c
$(1): LET m=2: GO SUB 900: LET c
$=d$
 280 IF i$<>"HL" AND NOT i THEN
GO TO 850
 300 IF g=1 THEN LET b$="("+b$+"
)"
 310 IF g=2 THEN LET c$="("+c$+"
)"
 700 PRINT p1;TAB 6;a$;TAB 11;b$
;: IF c$<>"" THEN PRINT ",";c$;"
"
 720 IF s THEN FOR z=p1 TO p-1:
LET g=PEEK z: PRINT TAB 21;g;TAB
 25;CHR$ (PEEK z AND (g<16 OR g>
23)): NEXT z
 730 PRINT : POKE 23692,255
 740 IF INKEY$<>"" THEN GO TO 45
00
 800 GO TO 110
 850 LET a$=n$: LET b$="": LET c
$="": BEEP .1,0: LET s=1: GO TO
700
 900 REM edit arguments
 920 IF d$="u" THEN LET q=PEEK p
: LET p=p+1: LET d$=STR$ (p+q-25
6*(q>127)): RETURN
 930 IF d$="v" THEN LET q=PEEK p
: LET p=p+1: LET d$=STR$ q: RETU
RN
 940 IF d$="w" THEN LET q=PEEK p
: LET d$=STR$ (q+256*PEEK (p+1))
: LET p=p+2: RETURN
 945 IF d$="↑" THEN LET d$=n$: B
EEP .1,10: LET s=1: RETURN
 950 IF i$<>"HL" THEN LET i=1
 955 IF d$="y" THEN LET d$=i$: R
ETURN
 960 LET g=m: IF i$="HL" THEN LE
T d$="HL": RETURN
 970 IF k=1 THEN LET f=PEEK p: L
ET p=p+1
 990 LET f=f-256*(f>127): LET z$
="+" AND f>=0: LET d$=i$+z$+STR$
 f: RETURN
1001 DATA ">",4000,b
1010 DATA "LD",r$(d),"w",0
1011 DATA "ADD","y",s$(d),0
1021 DATA ">",4010,b
1030 DATA "INC",s$(d),"",0
1031 DATA "DEC",s$(d),"",0
1041 DATA "INC",r$(b),"",0
1051 DATA "DEC",r$(b),"",0
1061 DATA "LD",r$(b),"v",0
1071 DATA v$(b),"","",0
1171 DATA "LD",r$(b),r$(c),0
1271 DATA x$(b),r$(c),"",0
1301 DATA "RET",q$(b),"",0
1310 DATA "POP",t$(d),"",0
1311 DATA ">",4020,d
1321 DATA "JP",q$(b),"w",0
1331 DATA ">",4030,b
1341 DATA "CALL",q$(b),"w",0
1350 DATA "PUSH",t$(d),"",0
1351 DATA "CALL","w","",0
1361 DATA x$(b),"y","",0
1371 DATA "RST",STR$ (b*8-8),"",
0
2071 DATA w$(b),r$(c),"",0
2171 DATA "BIT",STR$ (b-1),r$(c)
,0
2271 DATA "RES",STR$ (b-1),r$(c)
,0
2371 DATA "SET",STR$ (b-1),r$(c)
,0
3071 DATA "↑"
3101 DATA "IN",r$(b),"C",2
3111 DATA "OUT","C",r$(b),1
3120 DATA "SBC","HL",s$(d),0
3121 DATA "ADC","HL",s$(d),0
3130 DATA "LD","w",s$(d),1
3131 DATA "LD",s$(d),"w",2
3140 DATA "NEG",o$(d),"",0
3141 DATA "↑"
3150 DATA "RETN",o$(d),"",0
3151 DATA "RETI",o$(d),"",0
3161 DATA "IM",p$(b),"",0
3171 DATA ">",4040,b
3231 DATA u$(c)+y$(b),"","",0
3371 DATA "↑"
4001 DATA "NOP","","",0
4002 DATA "EX","AF","AF'",0
4003 DATA "DJNZ","u","",0
4004 DATA "JR","u","",0
4008 DATA "JR",q$(b-4),"u",0
4011 DATA "LD","BC","A",1
4012 DATA "LD","A","BC",2
4013 DATA "LD","DE","A",1
4014 DATA "LD","A","DE",2
4015 DATA "LD","w","y",1
4016 DATA "LD","y","w",2
4017 DATA "LD","w","A",1
4018 DATA "LD","A","w",2
4021 DATA "RET","","",0
4022 DATA "EXX","","",0
4023 DATA "JP","y","",1
4024 DATA "LD","SP","y",0
4028 DATA "↑"
4031 DATA "JP","w","",0
4032 DATA "↑"
4033 DATA "OUT","y","A",1
4034 DATA "IN","A","y",2
4035 DATA "EX","SP","y",1
4036 DATA "EX","DE","HL",0
4037 DATA "DI","","",0
4038 DATA "EI","","",0
4041 DATA "LD","I","A",0
4042 DATA "LD","R","A",0
4043 DATA "LD","A","I",0
4044 DATA "LD","A","R",0
4045 DATA "RRD","","",0
4046 DATA "RLD","","",0
4048 DATA "↑"
4500 PRINT "Address Bytes Nobyte
s Continue"
4510 IF INKEY$<>"" THEN GO TO 45
10
4520 IF INKEY$="A" THEN PAUSE 0:
 GO TO 100
4530 IF INKEY$="B" THEN LET s=1:
 GO TO 110
4540 IF INKEY$="N" THEN LET s=0:
 GO TO 110
4550 IF INKEY$="C" THEN GO TO 11
0
4560 GO TO 4520
4900 PRINT AT 21,5;"Bytes or Nob
ytes ?"
4910 IF INKEY$="B" THEN LET s=1:
 GO TO 4940
4920 IF INKEY$="N" THEN LET s=0:
 GO TO 4940
4930 GO TO 4910
4940 CLS
4990 LET n$=CHR$ 18+CHR$ 1+"?"
4995 LET o$=" ↑↑↑"
5000 LET r$="BCDEHLxA"
5002 LET p$="0↑12↑↑↑↑"
5005 DIM s$(4,2): DIM t$(4,2)
5010 FOR z=1 TO 4
5015 LET s$(z)="BCDEy SP"(2*z-1
TO 2*z)
5020 LET t$(z)="BCDEy AF"(2*z-1
TO 2*z)
5040 NEXT z
5050 DIM q$(8,2): DIM x$(8,3): D
IM v$(8,4): DIM w$(8,3): DIM y$(
8,2): DIM u$(8,2)
5055 FOR z=1 TO 8
5060 LET q$(z)="NZZ NCC POPEP M
"(2*z-1 TO 2*z)
5065 LET x$(z)="ADDADCSUBSBCANDX
OROR CP "(3*z-2 TO 3*z)
5070 LET w$(z)="RLCRRCRL RR SLAS
RA↑↑↑SRL"(3*z-2 TO 3*z)
5075 LET v$(z)="RLCARRCARLA RRA
DAA CPL SCF CCF "(4*z-3 TO 4*z)
5076 LET y$(z)="↑↑↑↑↑↑↑↑I D IRDR
"(2*z-1 TO 2*z)
5077 LET u$(z)="LDCPINOT↑↑↑↑↑↑↑↑
"(2*z-1 TO 2*z)
5080 NEXT z
6000 RETURN
9999 REM © Aug 82  David Hawkins
```

Classified

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Peek & poke

Peek your problems to our address. Ian Beardsmore will poke back an answer.

INFORMATION, HELP ME

D McIlfatrick of Salloon, Co Fermanagh, Northern Ireland, writes:

Q I was about to order a 48K Spectrum when I came across a company offering an 80K Spectrum, for the price of a 48K model. This was done by supplying a 64K add on, in place of the 32K offered by Sinclair, at the same price.

However, I have also read that the Z80a processor in the ZX81 can only address 64K, and 8K of that is used by the Sinclair Rom, so in fact the maximum available memory could only be 56K. Is this true of the Spectrum? I do not want to void my guarantee by having the 64K extra put in for no real gain, but if the claim is true it would be better for me to order a 16K Spectrum, and the 64K Ram extension.

A The Z80a processor in the Spectrum can only address 64K. In the Spectrum *16K* of that memory is used by the Rom, so it does not take a mathematical genius to work out that you will be left with a maximum possible 48K of user Ram at any one time. This does not mean that you cannot have a memory capacity larger than 48K, as long as the balance is not being used.

What the advertisement does not say is that the spare Ram can only be switched in after a corresponding or greater amount has been switched out to make room for it.

This is just one of the first of many such add-on memories of various sizes that will soon be available for the Spectrum. Extra Rams produced by independents are likely to be cheaper than the £50 or £60 that Sinclair will charge.

LOADING ONLY

M Haghsenas of Dunsmuir Grove, Tyne & Wear, writes:

Q I have written a few programs and would like to send them to your magazine, but I have no printer for my Vic20. However, I have access to a Pet with a printer. I would be grateful if you could tell me how to *Load* my Vic programs onto a Pet, so I can get a proper printout.

A For the unexpanded Vic20, type the first line in on the Pet, followed by *Poke* 4096,0 : *Poke* 41,16 : then *Clr/Ret*. No changes need to be made for a Vic that has the 3K expansion. If you have more than 3K then use the following: *Poke* 41,18 : *Poke* 4680, 0 : then *Clr/Ret*.

POSTING THE PRICE

Simon Young of Hermon Avenue, Blackpool, Lancashire, writes:

Q In the editorial of *Popular Computing Weekly*, July 22, you said that the Atari 400 could now be bought for under £200. I would be grateful if you could give me an accurate price, and an address where I could get one from.

Could you also clear up another question about the same machine. It was said that the 400 model could not have more than 16K user Ram, but I have seen an advertisement for 48K Ram. Which is right?

A The cheapest Atari that I can find is £199 from Deans of Kensington, 191 Kensington High Street, London W8. But, Deans do not say what postage and packing costs are.

As for your second question, the Atari 6502 chip is capable of addressing 64K, of which a block of 16K is allocated to memory. However, the 400 is designed in such a way that only 16K of this can be normally accessed.

The 48K extension is not recognised by Atari, whose technical department said that such an expansion will *Void the warranty*, as physical changes to the pcb are needed. However, Maplin assured me that they offer their own one year guarantee.

If you read our August 26 issue, you will see that Maplin chose to work with the Atari because it had so much potential. No one can doubt that the machine offers superb graphics. But it does strike me as odd that a company should develop a machine with so much potential, and then make it difficult for that potential to be fully realised by the average user.

. . . FROM SANTA

Andrew Morgan of Buscot Drive, Abingdon, Oxford, asks:

Q Could you please tell me if there is a machine code book available for the ZX Spectrum. Also do you know which tape recorders are compatible with ZX computers.

A As yet there are no Spectrum machine code books available that I know of. However, I know that at least one book is in preparation, and I would not be surprised if there were more.

There is going to be another ZX Microfair in November and I would suggest that you keep a look out around then. The run up to Christmas seems a logical time to release such a book.

As for tape recorders, Monolith makes a machine that is designed particularly for *Loading* and *Saving* on the ZX81. Data-Assette sells a Ferguson model that is also meant to remove the trouble normally associated with the ZX machines.

The Spectrum's *Load/Save* facilities have been improved by the introduction of a Schmit trigger. As yet, I have come across no *Save/Load* problems on the Spectrum. All you have to ensure is that your recorder has jack sockets of the right size (3.5mm).

Data-Assette is based at 44 Shroton Street, London NW1 6UG. Monolith's address is: 5-7 Church Street, Crewkerne, Somerset.

CAUGHT NAPPING

R S Guhra, of Alicia Gardens, Harrow, Middlesex, writes:

Q On Page 5 of *Popular Computing Weekly*, June 17, you say that the Spectrum has a design fault, and in the review section you say that it is crude and bug ridden. Only yesterday I ordered a Spectrum, but I feel uneasy and unsure of my choice now. Are there any simple programs which I can use to Benchtest my Spectrum and check all its functions easily?

On receipt of my Spectrum, I am allowed two weeks to make up my mind as to whether I want to purchase it. It would be useful to use this time to test the Spectrum to see if it malfunctions. The most obvious is *Print* 2+2 to see if it answers four. But there must be other programs to test it exhaustively.

A This is what happens when a company supplies a pre-production model for review. All the faulty Spectrums were caught before going out to the public (as far as we know). Only the computer press got the bad machines, and that has not done Uncle Clive's reputation much good.

You do not say whether you ordered a 16K machine or a 48K machine. Only the 16K machines were faulty, and these now have an extra Nand gate wired in. Our machine has had this modification and, apart from the fact that it looks messy, we have so far found no further bugs. It is thought that the later 16K machines will have the fault rectified on the pcb.

The 48K machines are late for the simple reason that Sinclair made the same mistake as Acorn in underestimating the demand for the larger machine. Far more people ordered the 48K version, and Sinclair Research were just not geared up to meet this demand.

● *Stop agonising over that problem. Write to Ian Beardsmore. Peek and Poke, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7 HF.*

Ian Beardsmore regrets that he cannot answer each question personally, so please do not enclose a SAE.

Competitions

Past your prime?

by Gordon Lee

It is useful to catagorise numbers in convenient groups. For example, a number can be odd or even, positive or negative, high or low, rational or irrational or prime or composite.

The last two terms are particularly interesting. A composite number is one that is divisible by numbers, or factors, other than itself and 1 — 78 is a composite as it has the factors 13 and 6. Six is itself a composite, being 2 × 3. However, 13, 3 and 2 cannot be subdivided any further, so these are said to be prime. We can therefore say that the prime factors of 78 are 2, 3 and 13. Any composite number has a unique set of prime factors.

Unfortunately, there is no easy way of telling if a number is prime or composite. Two is the only even prime number. If the last digit is a five then it is divisible by 5. After that, however, there is no way of telling — each number must be laboriously checked to see if it is prime.

The following program divides a chosen number by all the primes between 3 and the square root of the number. (In fact, for simplicity it divides by all odd numbers, but these must include all primes greater than 3.)

```
10 PRINT "ENTER AN ODD NUMBER"
20 INPUT T
30 IF T/2 - INT (T/2) = 0 THEN GOTO 20
40 FOR N = 3 TO (SQR T) + 0.5
50 IF T/N - INT (T/N) = 0 THEN GOTO 100
60 NEXT N
70 PRINT T;" IS PRIME"
80 STOP
100 PRINT T;" IS NOT PRIME"
110 PRINT "IT HAS FACTORS ";N;";AND;";T/N
```

The Greek mathematician Eratosthenes, in the third century BC, was the first to develop a technique for determining primes. First write out a list of all odd numbers from 3 up to as far as we wish to go. Take the first number, 3, circle it, and then divide each number in the list by three. Cross out all the multiples of three.

At the end of the list, go back to the next number after 3 that is *not crossed out*. This is 5, the next prime. Circle it and repeat the process, crossing out all multiples of 5 in the list. Continue until all the numbers are either circled or crossed out. The circled numbers are the primes.

(3)	(5)	(7)	~~9~~	(11)	(13)	~~15~~	(17)	(19)	~~21~~
(23)	~~25~~	~~27~~	(29)	(31)	~~33~~	~~35~~	(37)	~~39~~	(41)
(43)	~~45~~	(47)	~~49~~	~~51~~	(53)	~~55~~	~~57~~	(59)	(61)
~~63~~	~~65~~	(67)	~~69~~	(71)	(73)	~~75~~	~~77~~	(79)	~~81~~
(83)	~~85~~	~~87~~	(89)	~~91~~	~~93~~	~~95~~	(97)	~~99~~	(101)

This may be cumbersome, but it is one of the few methods by which primes and composites can be separated.

Since the turn of the century a large table of primes has been compiled and is housed in the Vienna Academy of Sciences. Unfortunately, the six-volume work containing all the primes between 1 and 100,000,000 has one volume missing. As a result there is a task awaiting anyone who is prepared to check the numbers between 13 million and 23 million.

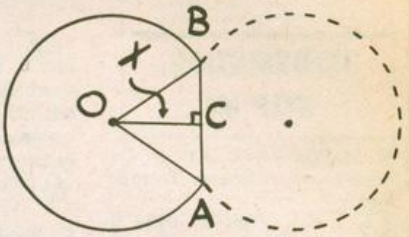
Here is a problem that will be answered in two weeks time. Can you give a proof that it is impossible to construct a right-angled triangle with all the sides having a prime number of units?

Puzzle No 23

Several early attempts were made to find a formula that would generate prime numbers only. One such attempt was: $p = z^2 + z + 41$, where z is a positive integer. When $z = 1$ the formula gives the prime, 43, and gives further primes for higher values of z.

Unfortunately, the formula is not infallible. What is the lowest positive integer for which this formula fails to give a prime number?

Solution to Puzzle No 19



The areas of the two pools are the same. So, the area of half the Smith's pool is π × 12.5 × 12.5/2 which is the area of the larger sector AOB plus the area of the triangle AOB.

In the diagram, the area of the sector AOB = (π × 81 × (360 − (ACS (X/9) × 360π))/360) and the area of the triangle AOB = (X × SQR(81 − X × X)).

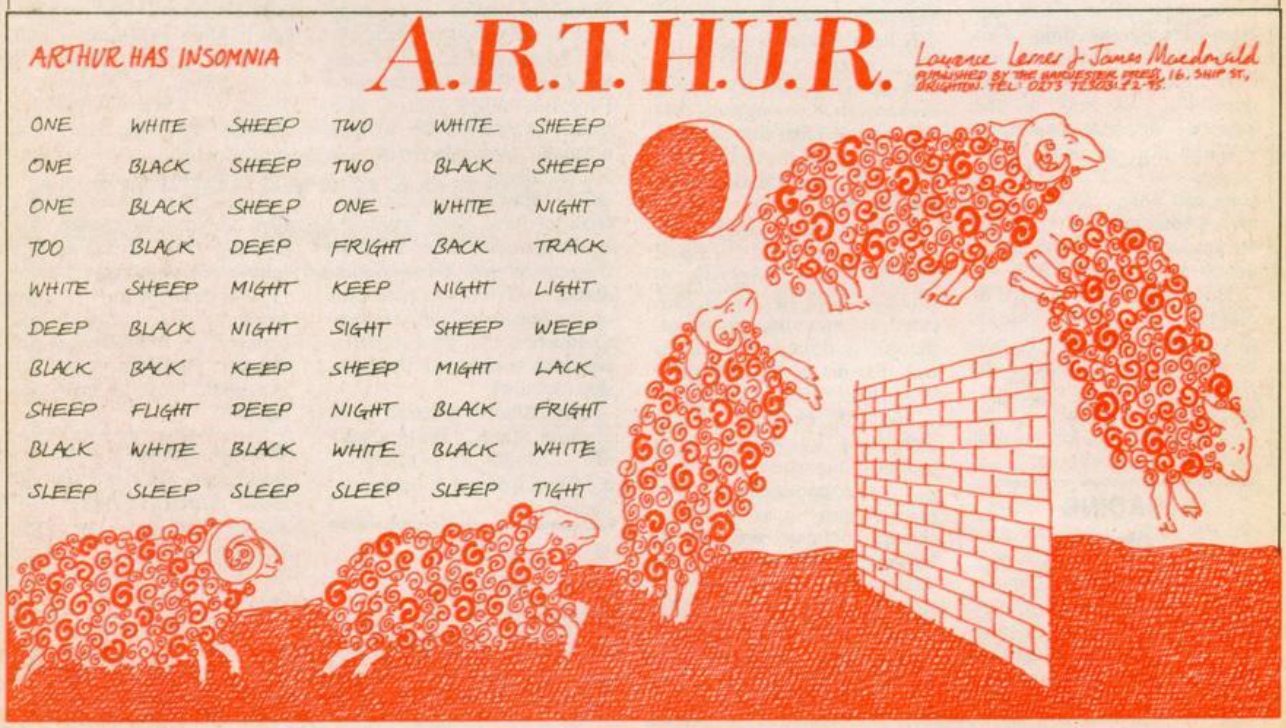
The program assigns a value to X which is used to find the area of the Smith's pond, A. This is compared with the area of the Jones' pond, J, and X is corrected accordingly.

```
10 LET X = 8
20 LET J = PI * 12.5 * 12.5/2
30 LET A = (PI * 81 * (360 - (ACS (X/9) *
   360/PI))/360) + (X * SQR (81 - X * X))
40 IF ABS (A - J) < 0.000001 THEN GOTO 100
50 LET X = X * J/A
60 GOTO 30
100 PRINT "X = ";X
```

The distance apart of the centres of the two circles, 2X, is found, using the program, to be 15.224 ft.

Winner of Puzzle No 19

The winner is: Mark Chidlow, Mountbatten Avenue, Sandal, Wakefield, W Yorks, who receives £10.



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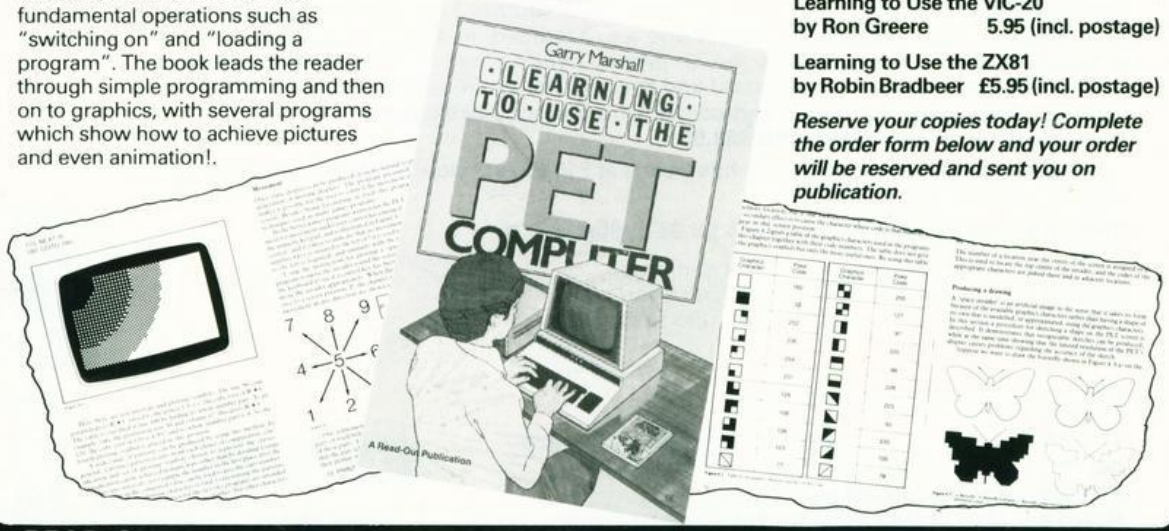

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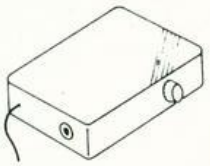

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